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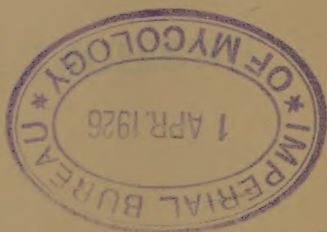
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BRITISH LICHENS

A MONOGRAPH
OF THE
BRITISH LICHENS

A DESCRIPTIVE CATALOGUE
OF THE SPECIES IN THE
DEPARTMENT OF BOTANY, BRITISH MUSEUM

PART II
SECOND EDITION REVISED

BY
ANNIE LORRAIN SMITH, F.L.S.

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A MONOGRAPH
OF THE
BRITISH LICHENS

A DESCRIPTIVE CATALOGUE
OF THE SPECIES IN THE
POSSESSION OF THE BRITISH MUSEUM

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THE
BRITISH MUSEUM

PREFACE TO FIRST EDITION

THE long interval in time between the publication of Parts I. and II. of the Monograph of British Lichens has been caused by the continued ill-health and ultimate death of the Rev. James Crombie, the author of Part I. Mr. Crombie had determined, and partly arranged, a number of specimens, and had also begun to prepare descriptions of the genera and species for Part II., when the work was finally interrupted by his death in 1906. His collections, together with his MSS., were generously presented to the Trustees of the British Museum by Mrs. Crombie, and I was fortunately able to arrange with Miss Annie Lorrain Smith to continue the work. In the preparation of Part II. Miss Smith has followed the form and arrangement adopted in Part I., except where divergence seemed absolutely necessary.

A. B. RENDLE.

DEPARTMENT OF BOTANY,
BRITISH MUSEUM (NATURAL HISTORY),
CROMWELL ROAD, LONDON, S.W.

February 1911.

PREFACE TO SECOND EDITION

THE preparation of the new edition has given opportunity for revision and for the incorporation of the large amount of material received at the Museum since the publication of the first edition in 1911. These additions include the herbarium of J. R. Martindale, a set of Dr. James Stirton's lichens, and some of the later issues of the Rev. W. Johnson's *exsiccatae*.

Some of the families included in the Appendix to Part I. have now been incorporated in Part II.

A classified list of species of Microfungi recorded by British authors as Lichens has been added; and an Appendix including emendations and additions to Part I. (1918) brings the whole work up to date.

A. B. RENDLE.

DEPARTMENT OF BOTANY,
BRITISH MUSEUM (NATURAL HISTORY),
CROMWELL ROAD, LONDON, S.W.
January 1926.

NOTE TO FIRST EDITION

IN the preparation of Part II. of the Monograph of British Lichens I have incorporated, as far as possible, the work previously done by Mr. Crombie, and the classification adopted follows, for the most part, the main lines of that projected by him in the first volume. Any discrepancies between the sequence of orders and genera and that outlined in the Synopsis in Part I. are explained where they arise. The "Natural Orders" under which the genera are classified correspond with the "Families" recognised by A. Zahlbruckner in Engler and Prantl's "Pflanzenfamilien." In Mr. Crombie's Synopsis the "Families" represent the first grade of division of the Lichens and are subdivided into series, tribes and genera. In Part II. the term "Natural Order" has been employed to avoid confusion, and, at the same time, to bring the Monograph into line with recent systematic methods.

According to modern views, more importance is assigned to the microscopic structure of the fruit than was allowed by Nylander and Crombie in their scheme of classification. The systematic value of the form, colour and septation of the spores had, however, already been recognised by Massalongo and other continental Lichenologists, and by Mudd in our own country.

I wish to acknowledge my great indebtedness to the Staff of the Botanical Department of the British Museum with whom I have been associated during the course of the work and whose assistance has been most fully given, and to Dr. A. Zahlbruckner, of Vienna, who has kindly advised me on some points of nomenclature. I have to thank Mr. A. W. Dennis, who brought to me the first specimens of *Gongylia viridis*, collected by Mr. B. W. J. Starling. For further new or rare specimens I am indebted to the Rev. D. Lillie, the Rev. W. Johnson, and the Rev. H. P. Reader, and to Messrs. E. M. Holmes, J. A. Martindale, J. A.

Wheldon and A. Wilson. I wish also to thank Mr. P. Highley for the care he has shown in making the drawings for the plates which have been expressly prepared for this work.

ANNIE LORRAIN SMITH.

NOTE TO SECOND EDITION

THERE have been no fundamental changes in the new edition. Some alteration in the grouping of species, especially in the genus *Lecidea*, has been made: the plan of the small Handbook * in giving leading importance to the internal structure and colouring of the apothecium has been followed, and should aid in the identification of species.

Generous help has been given by Miss M. C. Knowles, Messrs. D. A. Jones, H. H. Knight, J. Menzies, R. Paulson, Rev. P. G. M. Rhodes and Dr. W. Watson in sending specimens as well as new records of species or localities and in pointing out omissions in the text of the previous edition or errors in place-names. Their assistance has been invaluable and has been much appreciated. I have also to thank Dr. A. H. Magnusson for notes of his work on *Acarosporac*, and my colleagues in the Botanical Department for freely given advice on critical points.

ANNIE LORRAIN SMITH.

* *A Handbook of British Lichens*, [by Annie Lorrain Smith, F.L.S. Published by the Trustees of the British Museum, 1921. Price 6/6.

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CATALOGUE OF BRITISH LICHENS.

PART II.

Subseries II. *CYCLOCARPINEÆ* (continued).

Family XIX. **CÆNOGONIACEÆ.**

Thallus filamentous and byssoid, occurring in small patches or forming widely spreading layers. Apothecia with a proper margin only; asci 8-spored; spores colourless, simple or 1-septate.

Thallus with *Trentepohlia* gonidia..... 70. **Cænogonium.**

Thallus with *Cladophora* gonidia..... 71. **Racodium.**

70. **CÆNOGONIUM** Ehren. in Horæ Physicæ Berol. 120 (1820). (Pl. 1.)

Thallus composed of loose, branching filaments, usually brightly coloured. Algal cells *Trentepohlia*, forming a central strand which is closely invested by irregularly branching fungal hyphæ. Apothecia apical or lateral, shortly-stalked, discoid, not carbonaceous; paraphyses discrete, unbranched, sometimes faintly septate; spores eight in the ascus, colourless, fusiform or elliptical, simple or 1-septate. Spermatogones with fusiform straight spermatia.

This genus belongs almost exclusively to warm regions; it is represented in Europe by one species.

1. **C. ebeneum** A. L. Sm.—Thallus brownish-black, forming a wide-spreading soft felt of much-branched filaments which are constricted at short intervals; algal cells *Trentepohlia aurea*, surrounded by dark-brown fungal hyphæ which closely follow the outline of the alga. Apothecia not seen.—*C. germanicum* Glück in Flora lxxxii. 268 (1896). *Conferva ebenea* Dillw. Conf. t. 101 (1809). *Chroolepus ebeneus* Ag. Syst. 36 (1824); Hook. in Sm. Engl. Fl. v. 381. *Cystocoleus ebeneus* Thwaites in Ann. Mag. Nat. Hist. ser. 2, iii. 241, t. viii. B. figs. 1–3 (1849).

Exsicc. Leight. n. 348 (as *Racodium rupestre*).

The species is probably not uncommon, and, in damp localities, it spreads extensively over the substratum in round patches or in a radiating fan-like manner. The thallus is often invaded by a whitish *Lepraria*, which grows in scattered granules over the older parts of the lichen. It has been frequently confused with *Racodium rupestre*; so that it is impossible for the most part to determine the plants recorded by the older writers. *Byssus petraea nigerrima fibrosa* (observed by R. Richardson) Dill. in Ray Syn. Stirp. Brit. ed. 3. 57, n. 8 (1724), and quoted in Dill. Hist. Musc. 9, t. 11. f. 18 (1741), may be either plant. *Byssus nigra* Huds. Fl. Angl. ed. 2. 606 (1778). Engl. Bot. t. 702, and *Dematium rupestre* S. F. Gray Nat. Arr. i. 588 (1821), share the same uncertainty. Filaments are occasionally found intermingled with the alga *Trentepohlia aurea*.

Hab. On rocks and stones, in shady localities.—*Distr.* Somewhat rare in Great Britain.—*B. M.* St. Briands, Gloucestershire; Llanymawddwy, Merioneth; Bridgenorth, Shropshire; Sychnant, Conway, Carnarvonshire; Bolton Woods, Yorkshire; Kirkconnel, Springkell, Dumfriesshire; near Killin, Perthshire; Loch Morar and Moidart, Inverness.

71. **RACODIUM** Pers. Syn. Fung. 701 (1801). (Pl. 2.)

Thallus composed of loose, branching filaments, dark-coloured. Algal cells *Cladophora*, forming a central strand, the fungal hyphæ growing in straight lines, and forming a closely investing outer sheath. Apothecia and spermatogones unknown.

1. **R. rupestre** Pers. *l. c.*—Thallus brownish-black, felt-like, usually occurring in small patches, more rarely wide-spreading; filaments straight, not constricted, branched, fungal hyphæ very dark-coloured, obscuring the central algal strand.

As stated above, this plant has been frequently included with *Cœnogonium ebeneum* under the comprehensive name *Byssus nigra*.

Hab. On rocks in high latitudes.—*Distr.* Somewhat rare.—*B. M.* Anstey's Cove, Torquay, Devon; Exton, Somerset; Agron, Cleveland, Yorkshire; Tarbrook Fell, Lancashire; Aran Mawddwy, Merioneth; Abergwesyn, Breconshire; Dalry, Ayrshire; Carluke, Lanarkshire; near Killin, Perthshire; near base of Ben Cruachan and Ballachulish, Argyll; Kylemore, Connemara, Galway.

Family XX. **GYALECTACEÆ.**

Thallus crustaceous, thin, non-corticate. Algal cells *Trentepohlia* or rarely *Scytonema* (or *Phyllactidium* in tropical species). Apothecia brightly coloured, cup-like, partly margined by the thallus or with proper margin only; paraphyses well-developed; ascus usually 8-spored; spores colourless, variously septate. Spermatogones with almost simple sterigmata and straight rather short spermatia.

Gyalecta, previously regarded as a genus of *Lecideaceæ*, has been placed in the above family (along with other genera) on account of the algal and other characters. *Petractis*, *Eugyalecta* and *Microphiale*, treated by some lichenologists in distinct genera, have here been classified as sections of *Gyalecta*.

Algal cells *Scytonema* or *Trentepohlia*..... 72. **Gyalecta**.

72. **GYALECTA** Ach. Lich. Univ. 30 (1810). (Pl. 3.)

Thallus granular, pulverulent, or nearly obsolete; algal cells *Scytonema* or *Trentepohlia*. Apothecia brightly coloured, concave, with a prominent proper margin, somewhat urceolate-patellate; asci usually 8- rarely many-spored; spores variously septate, or muriform. Spermatogones with almost simple sterigmata and straight rather short spermatia.

Algal cells *Scytonema* § i. PETRACTIS (1).

Algal cells *Trentepohlia*.

Spores 3- or more-septate or

muriform § ii. EUGYALECTA (2-11).

Spores 1-septate § iii. MICROPHIALE (12-13).

§ i. PETRACTIS Fr. Summa 120 (1846) as genus. Algal cells *Scytonema*. Apothecia closed at first, the margin radially fissured.

1. **G. exanthematica** Fr. Lich. Eur. 197 (1831).—Thallus effuse, very thin, continuous, greyish-white (K —, CaCl —), mostly immersed. Apothecia small, immersed, pale-yellow or yellowish-flesh-coloured, the margin white, connivent, radiately (3-6) fissured, at length exposing the epithecium; hypothecium pale; paraphyses slender; spores fusiform, 3-septate, 15-20 μ long, 6-7 μ thick; hymenial gelatine pale-bluish with iodine.—*Lichen exanthematicus* Sm. in Trans. Linn. Soc. i. 81, t. 4. f. 1 (1791); Dicks. Crypt. fasc. iii. 14; With. Arr. ed. 3, iv. 22; Engl. Bot. t. 1184. *Thelotrema exanthematica* S. F. Gray Nat. Arr. i. 444 (1821); Hook. Fl. Scot. ii. 45 and in Sm. Engl. Fl. v. 161; Leight. Angioc. Lich. 32, t. 12. f. 3; Tayl. in Mackay Fl. Hib. ii. 103. *Lecidea exanthematica* Nyl. in Mém. Soc. Cherb. v. 119 (1857); Cromb. Lich. Brit. 62; Leight. Lich. Fl. 334; ed. 3, 355. *Petractis exanthematica* Fr. Summa 120 (1846); Mudd Man. 278, t. 5. f. 117.

Exsicc. Leight. n. 256.

Frequently placed in a separate genus *Petractis*, owing to the blue-green algal cells *Scytonema*. The thallus penetrates the rock to a depth of 3 to 4 mm., the alga being associated with the fungal hyphæ to the lowest limits. The apothecia are almost closed at first, becoming at length disciform. On disappearing they leave pits in the substratum.

Hab. On calcareous rocks and cretaceous stones in upland, rarely maritime, tracts.—*Distr.* Not uncommon in England, rare in the S.W. Highlands of Scotland and in the N. and S. of Ireland.—*B. M.* Shere, Surrey; Mount Harry, Fulking, and the Downs, Sussex; Chalk pit, Torquay and near Babbicombe, Devon; Cuning Dale and Deep Dale, Buxton, Derbyshire; Eglwyseg Rocks, near Llangollen, Denbighshire; Careg Cennen, Carmarthenshire; Ingleborough, Yorkshire; Egglestone and near Barnard Castle, Durham; Levens, Whitbarrow, and near Arnside, Westmorland; Lamplugh, Cumberland; Achosragan Hill, Appin, Argyll; near Belfast, Antrim; Kylemore Castle, Connemara, Galway; Killarney, Kerry; Castlebar, Mayo.

Var. *dolichospora* B. de Lesd. Lich. Dunk. Suppl. 116 (1914).—Thallus thin. Apothecia smaller and more superficial than in the species; spores larger, up to $35\ \mu$ long, $11\ \mu$ thick.

I am indebted to Dr. Watson for drawing my attention to this variety. Mr. Knight states that it is the common form in W. England and has also been observed in the Isle of Wight.

Hab. On Limestone.—*B.M.* Birdlip and Cirencester, Gloucestershire.

§ ii. EUGYALECTA A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 126 (1905). Algal cells *Trentepohlia*. Apothecial margin typically entire; spores 3- or more-septate or muriform.

2. *G. cupularis* Schær. Enum. 94 (1850).—Thallus effuse, very thin, continuous, subleprose, whitish or pale-greyish, partly immersed (K —, CaCl —). Apothecia moderate, superficial and prominent; epithecium impressed, concave, flesh-coloured or yellowish-red, the margin thickish, entire or at times radiostriate, whitish; hypothecium colourless; paraphyses slender, not well discrete; spores ellipsoid, 3- then multi-septate and muriform, $15\text{--}17\ \mu$ long, $7\text{--}9\ \mu$ thick (or up to $25\ \mu \times 12\ \mu$); hymenial gelatine slightly bluish then wine-red with iodine.—Mudd Man. 166 and *passim*, t. 3. f. 59; Leight. Angioc. Lich. 33, t. 13. f. 1. *Lichen cupularis* Ehrh. Beitr. iv. 45 (1789); Dicks. Crypt. fasc. ii. 18; With. Arr. ed. 3, iv. 22 (excl. hab. "on trees"). *Lichen marmoreus* With. l.c. (1796) (excl. hab. "on trees"); Engl. Bot. t. 739. *Lecidea cupularis* Ach. Meth. 56 (1803); Carroll in Nat. Hist. Rev. vi. 525; Cromb. Lich. Brit. 62; Leight. Lich. Fl. 352; ed. 3, 381. *L. marmorea* Ach. Syn. 46 (1814); Hook. in Sm. Engl. Fl. v. 184 (1833); Hook. Fl. Scot. ii. 40 (excl. hab. "on trees"); S. F. Gray Nat. Arr. i. 473; Tayl. in Mackay Fl. Hib. ii. 129 (excl. hab. "on trees").

Esicc. Bohl. n. 33, pl.; Leight. n. 122; Mudd n. 139; Cromb. n. 76; Larb. Lich. Hb. n. 186; Johns. n. 329.

As in the preceding species, the thallus penetrates the rock to a depth of $310\ \mu$ or more. The numerous but not crowded apothecia are almost closed at first, but become open with the margin frequently radiate-rugose except in muscicolous specimens.

Hab. On rocks, chiefly calcareous, and on mortar of walls, rarely on schistose rocks or overspreading mosses, in maritime, upland, and subalpine localities.—*Distr.* General and usually plentiful, where it occurs, in most parts of Great Britain; apparently rarer in N. and S. Ireland, as also in the Channel Islands.—*B. M.* Rozel, Jersey; Kymyal Cliff, near Penzance, Cornwall; Bathampton Downs, Somerset; Halling Hill, near Lewes, Sussex; Breda Hill, Leicestershire; Whitecliffe Rocks, near Ludlow, and Craig-y-Rhiw, Oswestry, Shropshire; Bilsdale and Guisboro' Moor, Cleveland, Yorkshire; Teesdale, Durham; Staveley and Mallerstang, Westmorland; Lamplugh, Cumberland; Island of Lismore and Appin House, Argyll; Craig Calliach, Ben Lawers, and

Craig Tulloch, Perthshire; Cuchullin Hills, Isle of Skye; Craig Guie and Morrone, Braemar, Aberdeenshire; Grogans Glen and Colin Glen, near Belfast. Antrim; Ballaghbeama Gap, Kerry; Ballynahinch and near Erriff, Connemara, Galway.

Var. **marmorea** Boist. Nouv. Fl. Lich. Fr. pt. 2, 178 (1902).—Distinguished from the species by the entire margin and by the habitat.—W. G. Travis, Lanc. Nat. iii. 82 (1910).

Recorded on decayed moss. The condition of the margin seems to be merely a growth phase that occurs in plants on limestone as well as in those on mosses.

Hab. On mosses on mortar of an old limestone wall at Downham, Lancashire.

3. **G. foveolaris** Schær. Enum. 94 (1850).—Thallus effuse, granulose or subleprose, whitish or greyish-white (K —, CaCl —). Apothecia moderate or somewhat large, numerous, scattered, urceolate, flesh- or pale-rose-coloured, the margin thin, entire or subcrenulate, paler; hypothecium colourless; paraphyses not well discrete; spores oblong-ellipsoid, 3-septate, 18–21 μ long, 6–7 μ thick; hymenial gelatine bluish then sordid with iodine.—*Urceolaria foveolaris* Ach. Meth. 149 (1803). *Lecidea foveolaris* Nyl. in Mém. Soc. Cherb. v. 119 (1857); Carroll in Journ. Bot. iv. 23 (1866); Cromb. Lich. Brit. 62; Leight. Lich. Fl. 334; ed. 3, 359.

Resembles *Gyalecta rubra* in the form of apothecia and spores, but differs in the absence of an outer thalline margin.

Hab. Incrusting decayed mosses on the ground in subalpine and alpine regions.—*Distr.* Sparingly in Yorkshire and on the Grampians, Scotland.—B. M. Teesdale, Durham; Craig Calliach, Ben Lawers and Killin, Perthshire; Morrone, Braemar, Aberdeenshire.

4. **G. geoica** Ach. Lich. Univ. 31 (1810).—Thallus effuse, thin, subpulverulent, greyish (K —, CaCl —). Apothecia minute, urceolate, more or less immersed, pale yellowish-flesh-coloured, the margin entire, persistent, whitish; hypothecium pale; paraphyses somewhat coherent, clavate at the apices; spores oblong or ellipsoid, 3-septate, usually 12–15 μ long, 6–7 μ thick; hymenial gelatine bluish then sordid-violet with iodine.—*G. Wahlenbergiana* Ach. Syn. 9 (1814); Leight. Angioc. Lich. t. 13. f. 2. *G. foveolaris* Mudd Man. 167 (1861) (non Schær.). *Lichen geoicus* Wahlenb. in Vet. Ak. Handl. 142, t. 4. f. 5 (1806). *Lecidea geoica* Nyl. in Mém. Soc. Cherb. v. 119 (1857); Cromb. Lich. Brit. 62; Leight. Lich. Fl. 333; ed. 3, 359.

Exsicc. Leight. n. 123.

Closely related to the preceding, with which at times it has been confounded, but differs in the much smaller fructification and the shorter spores. The disc of the numerous, at times aggregate, apothecia often collapses in age, so that, as in other plants of this section, they appear whitish from the colour of the hypothecium.

Hab. On calcareous soil among rocks and on wall-tops in upland rarely maritime situations.—*Distr.* Very local in England and the Highlands of Scotland.—*B. M.* Cromer, Norfolk; Stiperstones and Whitecliffe Rocks, near Ludlow, Shropshire; Barcaldine, Argyll; Craig Calliach and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire.

5. *G. rubra* Massal. Ric. Lich. Crost. 146 (1852).—Thallus effuse, thin, powdery or granulose, whitish, the hypothallus whitish, scarcely visible (K—). Apothecia moderate in size (rarely up to 1.5 mm. across), at first closed then open and concave, the disc rosy-red or reddish flesh-coloured, sometimes slightly pruinose, the outer margin prominent, persistent, crenulate; paraphyses stoutish, septate, clavate and red at the tips; spores oblong-ellipsoid, 3-septate, 15–23 μ long, 5–8 μ thick.—Mudd Man. 166, t. 3, fig. 58. *Patellaria rubra* Hoffm. Pl. Lich. i. 81, t. 17, fig. 2 (1790). *Parmelia rubra* Ach. Meth. Lich. 170 (1803); Leight. Angioc. Lich. 86, t. 14, fig. 1. *Lecanora rubra* Ach. Lich. Univ. 389 (1810); Hook. Fl. Scot. ii. 49 & in Sm. Engl. Fl. v. 190; Cromb. Lich. Brit. 58 & Monogr. i. 457; Leight. Lich. Fl. 230; ed. 3, 222. *Lichen Ulmi* Sm. Engl. Bot. t. 2218 (1810). *Rinodina rubra* S. F. Gray Nat. Arr. i. 457 (1821). *Phialopsis rubra* Koerb. Syst. Lich. Germ. 170 (1855); Mudd Man. 165.

Exsicc. Cromb. n. 168; Leight. n. 236; Mudd n. 138.

Forming a thin widely effuse scurf on the substratum of bark or moss. The apothecia are numerous and prominent and well marked by the white crenulate margin and the rose-red disc.

Though classified by various lichenologists under *Lecanora*, the structure of the thallus (with *Trentepohlia* gonidia), and of the apothecia, agree with the *Gyalecta*.

Hab. On old trunks of trees—oaks or elms, and on mosses on walls, &c.—*Distr.* Local or rare in S. W. and N. England and in the Scottish Highlands.—*B. M.* Beeding Priory, Sussex; Wignore Castle, Herefordshire; Craig-y-Rhiw, near Oswestry, Shropshire; near Rievaulx, Bilsdale and Greta Bridge, Yorkshire; Craig Tulloch, Blair Athole, Perthshire.*

* “*Phialopsis livida* Mudd Man. 166 (1861).—Thallus effuse, thinnish, subtartareous, granulose-verrucose, becoming somewhat leprose, white. Apothecia small, not numerous, scattered, sessile, the disc dull- or bluish-black, slightly concave then plane, the margin thickish, smooth, polished, white; hypothecium dark-red, grumous; spores ellipsoid-oblong, irregularly 4-celled.” Specimen not seen.

Mudd has stated that “this species somewhat resembles *Lecanora*. (*Aspicilia*) *verrucosa* in its mode of expansion and outward appearance. It may be known by the colour of its hypothecium, stout paraphyses and by the internal organization of its spores.” In the absence of specimens it is advisable to leave it where Mudd placed it—next to “*Phialopsis rubra*.” Carroll (Journ. Bot. vi. 100, 1868) has suggested that this may be a state of *Biatorma pulverea*, but the spores are different.

Hab. On the trunks of old trees, Killarney, Kerry.

6. *G. truncigena* Hepp Flecht. Eur. n. 27 (1853).—Thallus effuse, very thin, subleprose, greyish, often evanescent (K —, CaCl —). Apothecia small, urceolate, pale reddish flesh-coloured, the margin thick, entire, whitish; hypothecium colourless; spores 8, oblong-fusiform or oblong, 5–7-septate, usually with one or two longitudinal septa, 16–23 μ long, 7–9 μ thick; hymenial gelatine pale-bluish with iodine.—Mudd Man. 167, pro parte. *G. Wahlenbergiana* var. *truncigena* Ach. Lich. Univ. 152 (1810). *Lecidea truncigena* Nyl. in Mém. Soc. Cherb. v. 119 (1857); Cromb. Lich. Brit. 62; Leight. Lich. Fl. 352; ed. 3, 381.

Ersicc. Leight. n. 147; Larb. Lich. Hb. n. 188.

This plant and *G. Flotovii* were confused by earlier authors under the name *Lichen marmoreus* with *L. cupularis*, to states of which it is externally subsimilar. It differs, however, in the smaller apothecia, the mode of division of the rather longer spores, and in the nature of the substratum. In the British specimens the thallus is often little visible, and the apothecia are somewhat scattered.

Hab. On the trunks of trees, chiefly elms and ash, in wooded maritime and upland tracts.—*Distr.* Sparingly in England and S. Ireland.—*B. M.* I. of Wight; Lyndhurst, New Forest, Hants; Ilsham, Torquay, Devon; near Penzance, Cornwall; Glynde, Hurst Wood, Tunbridge Wells, and Lavington Common, Sussex; Kemble, Gloucestershire; near Cambridge; Twycross, Leicestershire; Ingleby, Cleveland, Yorkshire; Lowes Park, Westmorland; Castlemary, Cork; Killarney and Derryquin, Kerry; Tervoe, near Limerick; Dromoland, Clare; Curraghmore, Waterford.

7. *G. derivata* A. L. Sm. Monogr. Brit. Lich. i. 485 (1918).—Thallus effuse, thin, finely furfuraceous, greyish or greenish. Apothecia small, urceolate, the disc pale-reddish, the margin whitish, thick, entire or broken here and there; spores elongate, 27–30 μ long, 3–5 μ thick, 7–12 septate, some of the cells becoming longitudinally septate.—*G. truncigena* var. *derivata* Boist. Nouv. Fl. Lich. Pt. 2, 179 (1902). *Lecidea derivata* Nyl. in Flora xlviii. 603 (1865).

Near to *G. truncigena* but differing in spore characters.

Hab. On tree trunks.—*B. M.* Navan, Meath. Collected by M. C. Knowles, Aug. 1915.

8. *G. Flotovii* Koerb. Syst. Lich. Germ. 171 (1855).—Thallus effuse, very thin, subleprose, greyish, often evanescent (K —, CaCl —). Apothecia subminute, urceolate, pale-flesh-coloured, the margin thickish, entire, whitish; hypothecium colourless; spores ellipsoid, irregularly submuriform, 11–21 μ long, 8–9 μ thick; hymenial gelatine pale-bluish with iodine.—*G. truncigena* Mudd Man. 167 (1867) pro parte. *G. Wahlenbergiana* var. β Leight. Angioc. Lich. 86, t. 13. f. 3 (1851) (non Ach.). *Lichen tricolor* With. Arr. ed. 3, iv. 23 pro parte, t. 31. f. 6 (1796). *Lecidea querceti* Nyl. Lich. Scand. 191 (1861); Cromb. in Grevillea xii. 60. *L. Flotovii* Carroll in Journ. Bot. iii. 289 (1865); Cromb. Lich. Brit. 63; Leight. Lich. Fl. 353; ed. 3, 382.

Ersicc. Mudd n. 140.

Differs from *G. truncigena*, for which it is apt to be mistaken, in the smaller apothecia and in the form of the more divided, smaller spores. It is evidently the plant primarily intended by Withering as his *Lichen tricolor*, as appears not only from the specimens in his own herbarium, but also from his diagnosis—"saucers very minute, orange-coloured, deeply hollowed, like the cup of a *Peziza*, the border pale-brown."

Hab. On the smooth trunks of trees, elm and ash, in wooded upland tracts.—*Distr.* Local and scarce in England, N. Wales, the S.W. Highlands of Scotland and S. Ireland.—*B. M.* Haywards Heath; near Glynde and Hurst and Danny, Sussex; Lustleigh, Devon; Thurlbeer, Somerset; Stowell Park, Gloucestershire; Castle Moreton, near Malvern, Worcestershire; Harlech, Merioneth; Bilsdale, Yorkshire; Lowther Park and Levens Park, Kendal, Westmorland; Barcaldine, Argyll; Blarney, Cork; Castleconnel, Limerick.

9. *G. carneolutea* Boistel Nouv. Fl. Lich. pt. 2, 178 (1902).—Thallus indeterminate, thin, smooth, continuous, white or glauco-whitish (K —, CaCl —). Apothecia small, subinnate, at first closed, then irregularly stellate-dehiscient with the epithecium at length nearly plane, yellowish flesh-coloured, the margin thin, whitish, lacerate or crenate, at length almost disappearing; hypothecium pale; spores oblong or linear-oblong, 3-septate, 11–13 μ long, 5–6 μ thick; hymenial gelatine faintly bluish with iodine.—*Parmelia carneolutea* Turn. in Trans. Linn. Soc. ix. 145, t. 12. f. 2 (1808); Leight. Angioc. Lich. 86, t. xiv. f. 2. *Lichen carneoluteus* Sm. Engl. Bot. t. 2010 (1809). *Lecanora carneolutea* Ach. Lich. Univ. 374 (1810); Hook. in Sm. Engl. Fl. v. 191 (1833). *Rinodina carneolutea* S. F. Gray Nat. Arr. i. 454 (1821). *Lecidea carneolutea* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 347 (1856); Cromb. Lich. Brit. 63; Leight. Lich. Fl. 335; ed. 3, 357. *Lecania carneolutea* Mudd Man. 140 (1861).

Exsicc. Leight. n. 363; Larb. Cæsar. n. 30; Lich. Hb. n. 348; Cromb. n. 77.

In their earlier and more advanced stages of development, the apothecia closely resemble those of *G. exanthematica*. The British specimens are well fertile, with the apothecia occasionally submoderate in size.

Hab. On trunks of trees, chiefly elm, rarely ash, in maritime and upland situations.—*Distr.* Only in S. England and the Channel Islands, but plentiful where it occurs.—*B. M.* St. Brelade's Bay and Quenvais, Jersey; Guernsey; Lydd, Kent; near Lewes, Beeding Priory, Angmering, and Glynde, Sussex; Lymington, Hants; Brading, St. Lawrence and Shanklin, Isle of Wight; Ilsham Valley, Torquay, and near Ilfracombe, Devon; near Plymouth and near Penzance, Cornwall.

10. *G. cornea* A. L. Sm.—Thallus effuse, very thin, granulose-pulverulent, whitish (K —, CaCl —), often evanescent. Apothecia small, adnate, somewhat concave or suburceolate, reddish or brownish flesh-coloured, the margin entire, smooth, paler; hypothecium colourless; spores elongate-acicular, multi-(9–13-) sep-

tate, 58–80 μ long, 3–4 μ thick; hymenial gelatine pale-bluish with iodine.—*Lichen corneus* With. Arr. ed. 3, iv. 20, t. 31. f. 3 (1796) (non herb.); Engl. Bot. t. 965; Leight. Angioc. Lich. 86, t. xiv. f. 4. *Lecidea carneola* Ach. Lich. Univ. 194, t. 2. f. 7 (1810); Nyl. Lich. Scand. 191; S. F. Gray Nat. Arr. i. 472; Carroll in Journ. Bot. vi. 100 (1868); Cromb. Lich. Brit. 63; Leight. Lich. Fl. 34; ed. 3, 367. *L. cornea* Hook. in Sm. Engl. Fl. v. 183 (1833); Tayl. in Mackay Fl. Hib. ii. 128. *Bacidia carneola* Koerb. Syst. Lich. Germ. 186 (1855); Mudd Man. 182. The description and fig. of Withering correspond with this plant, though the specimens in his herbarium belong to a different species, *Biatorina Griffithii* Massal. (cf. Grevillea xii. 59).

Exsicc. Leight. n. 117; Johns. n. 330.

This species has been placed under the genus *Pachyphiale* Lönnr. by various lichenologists. It is well characterized by the form, septation and size of the spores, which readily distinguish it from all the allied species. The apothecia, somewhat scattered, are semitransparent, and become in age less concave, with the margin darker. At times the whole plant is more or less infested by a reddish *Trentepohlia*.

A plant corresponding with this in the form and septation of the spores is *Lecidea chrysophora* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 438 (1856); but this is doubtfully British.

Hab. On smooth bark of trees in wooded maritime and upland districts.—*Distr.* Somewhat rare in England and Wales; rare in S.W. Ireland; not seen from Scotland or the Channel Islands.—*B. M.* Near Ryde, Isle of Wight; Lyndhurst, New Forest, Hants; Lustleigh, Devon; Ashdown Forest, Tilgate, and Eridge Park, Sussex; near Colesborne, Gloucestershire; Twycross, Leicestershire; Barmouth, Merioneth; Trefriw, Garn and Gwdir, Denbighshire; Haughmond Hill, Shropshire; Egglestone and Teesdale, Durham; Levens Park, Westmorland; Keswick, Cumberland; Dinis, Killarney, Kerry.

11. *G. corticola* A. L. Sm.—Thallus effuse, very thin, sordid-greenish (K —, CaCl —), often evanescent. Apothecia minute, concave, at length slightly prominent, pale-red or somewhat brick-red, the margin subconcolorous; paraphyses slender; hypothecium colourless; spores 24–32 in the ascus, fusiform, 3–7-septate, 16–34 μ long, 5–7 μ thick; hymenial gelatine pale-bluish with iodine.—*Pachyphiale corticola* Lönnr. in Flora xli. 612 (1858). *Lecidea congruella* Nyl. Lich. Scand. 191 (1861); Cromb. in Grevillea xxii. 8.

Externally somewhat similar to *G. truncigena*, but distinct in the number, septation and form of the spores. In the single British specimen gathered, which is only sparingly fertile, the thallus is but little visible (*vide* Crombie).

Hab. On trunk of pine in wooded mountainous district. Recorded by Crombie from Craig Calliach Killin, Perthshire.

§ iii. MICROPHIALE Wain. Lich. Brésil. ii. 70 (1890). Algal cells *Trentepohlia*. Apothecia with entire proper margin; spores 1-septate, similar to spores of *Biatorina*, under which genus the species were formerly classified (see ed. 1, 13).

12. *G. lutea* Tuck. in Proc. Amer. Acad. Arts and Sci. vii. 227 (1868).—Thallus effuse, very thin, scurfy, greyish-white (K —, CaCl —), at times almost evanescent. Apothecia rather small, sessile, concave then plane or slightly convex, deep yellow or yellowish-orange, the margin paler entire, thin, often flexuose; hypothecium colourless; paraphyses loosely coherent, slender; spores oblong or fusiform-oblong, 9–13 μ long, 4–5 μ thick; hymenial gelatine pale-bluish then violet with iodine.—*Lichen luteus* Dicks. Crypt. fasc. i. 11. t. 2. f. 6 (1785); With. Arr. ed. 3, iv. 25; Engl. Bot. t. 1263; Leight. Angioc. Lich. t. 14. f. 3. *Lecidea melizea* Ach. Lich. Univ. 194 (1810); S. F. Gray Nat. Arr. i. 474. *L. lutea* Borr. ex Hook. in Sm. Engl. Fl. v. 185 (1833); Tayl. in Mackay Fl. Hib. ii. 129; Cromb. Lich. Brit. 63; Leight. Lich. Fl. 317; ed. 3, 341. *Biatorina lutea* Arn. in Flora xliii. 152 (1859); Mudd Man. 177; A. L. Sm. Monogr. Brit. Lich. ii. ed. 1, 113.

Exsicc. Carroll Lich. Hib. n. 16; Cromb. n. 78; Larb. Cæsar. n. 29 & Lich. Hb. n. 152; Phillips Elvell. Brit. n. 135.

This species and the following are well marked by the brightly coloured superficial apothecia. Occasionally those of *G. lutea* are rather large, with an inflexed more or less lobulate margin (f. *sublobulata* Cromb. (Grevillea xxii. 8 (1893))). The spermogones, which are not infrequent, are urceolate, somewhat resembling young apothecia.

Hab. On the bark of trees and on mossy trunks in maritime and upland districts.—*Distr.* Here and there in England, Wales and Ireland, rare in the S.W. Highlands of Scotland and in the Channel Islands.—*B. M.* Rozel, Jersey; Danny, Ardingley, and Hurstpierpoint, Sussex; New Forest, Hants; near Exeter, near Ilfracombe, Tavistock, near Dartmouth, Holme Chase and Ullacombe, near Bovey Tracey, Devon; Launceston, Tregawn, near Withiel and Penzance, Cornwall; Dolgelly, Barmouth and foot of Cader Idris, Merioneth; Llandyssil, Cardiganshire; Abergwesyn, Breconshire; Lochnaw, Wigtownshire; Inverary and Barcaldine, Argyll; Ardrum and Enniskean, Cork; Askew Wood, Dunkerron, Glengariff and Killarney, Kerry; Lough Inagh, Connemara, Galway; Belleclare, Mayo; near Belfast, Antrim.

13. *G. diluta* Wain. in Medd. Soc. Faun. & Fl. Fenn. x. 4 (1883).—Thallus effuse, very thin, scurfy, greenish- or greyish-white (K —, CaCl —), often evanescent. Apothecia minute, concave, pale-reddish-yellow or pale-flesh-coloured, the margin paler, entire, thickish; hypothecium colourless; paraphyses slender, discrete; spores fusiform, 9–13 μ long, 3–5 μ thick; hymenial gelatine pale-bluish with iodine.—*Peziza diluta* Pers. Syn. 668 (1801). *Lichen pineti* Schrad. ex Ach. Meth. 68 (1803). *L. effusus* Sm. Engl. Bot. t. 1863 two lower figures (1808) (non Ach.). *Lecidea pineti* Ach. Lich. Univ. 195 (1810); Hook. in Sm. Engl. Fl. v. 183; Cromb. Lich. Brit. 63; Leight. Lich. Fl. 317. *L. diluta* Leight. Lich. Fl. ed. 3, 343 (1879). *Biatorina diluta* Th. Fr. Lich. Arct. 185 (1860); A. L. Sm. Monogr. l.c.

Exsicc. Leight. n. 89; Mudd n. 145; Larb. Lich. Hb. n. 187.

An inconspicuous plant, the thallus being often scarcely visible; the apothecia, though abundant, are very minute. Occasionally they are congested and almost whitish (f. *leucostigma* Leight. Lich. Fl. ed. 3, 344, recorded on elm).

Hab. On the trunks of old firs in maritime and upland districts.—*Distr.* Somewhat local in Great Britain and Ireland, rare in the Channel Islands.—*B. M.* Rozel, Jersey; Ulting, Hadleigh Woods; Stanstead, Mount Fitchet and Hockley Woods, Essex; Wakehurst, Midhurst and Woolstonbury, Sussex; Brockenhurst and near Stoney Cross, New Forest, Hants; Sapperton, Gloucestershire; near Newmarket, Cambridgeshire; Twycross and Gopsall, Leicestershire; Welshpool, Montgomeryshire; Bettws-y-Coed, Denbighshire; Shrewsbury, Shelton and Llanforda, Shropshire; Costessey, near Norwich, Norfolk; Cliffrigg, Cleveland, Yorkshire; Craggy Park, Staveley, and Kirkby Lonsdale, Westmorland; Barcaldine, Argyll; Glen Falloch and Ben Lawers, Perthshire; Durris, Kincardineshire; near Cork; Glenstele, Tipperary; near Limerick, Clare.

Family XXI. LECIDEACEÆ.

Thallus minutely squamulose or crustaceous, sometimes obsolete. Algal cells Protococcaceæ. Apothecia discoid or patellate with proper margin only; spores usually 8 in the ascus, rarely fewer or more, simple or variously septate, colourless or coloured. Spermatogones immersed, spermatia elongate, ellipsoid, cylindrical or arcuate.

The view held by early writers that the form of the spores is of generic importance has been revived by recent lichenologists. The genera have been arranged according to spore-characters as follows:—

Spores colourless.

Spores simple.

- | | |
|---------------------------------------|-------------------------|
| 8 (rarely more or fewer) in the ascus | 73. <i>Lecidea</i> . |
| Many in the ascus | 74. <i>Biatorella</i> . |

Spores septate.

- | | |
|---|------------------------|
| 1-septate | 75. <i>Biatorina</i> . |
| 3- or more-septate, fusiform | 76. <i>Bilimbia</i> . |
| Pluri-septate, elongate, acicular | 77. <i>Bacidia</i> . |

Spores brown, septate.

- | | |
|-----------------------------|--------------------------|
| 1-septate | 78. <i>Buellia</i> . |
| 3-septate (parasitic) | 79. <i>Leciographa</i> . |

Spores colourless or becoming brown, septate.

8 in the ascus:

- | | |
|---|--------------------------|
| Muriform (sometimes 1-3-septate in species 1) | 80. <i>Rhizocarpon</i> . |
|---|--------------------------|

1 in the ascus:

- | | |
|--------------------------------------|----------------------------|
| Elongate, pluri-septate, large | 81. <i>Bombyliospora</i> . |
| Muriform, large | 82. <i>Lopadium</i> . |

73. *LECIDEA* Ach. Meth. 32 (1803); emend. Th. Fries Lich. Scand. 410 (1874).

Thallus squamulose or crustaceous, pulverulent, granular, continuous or areolate, sometimes evanescent; hypothallus per-

sistent or indistinct. Algal cells Protococcaceæ. Apothecia either light-coloured to dark-brown and biatorine, or black and lecideine, the proper margin often obliterated; spores usually eight in the ascus, ellipsoid or oblong, simple, colourless; hymenial gelatine variously tinged with iodine. Spermatogones with spermatia acicular, straight, rarely arcuate, or shortly cylindrical.

This extensive genus has been grouped under four sections. The spores are colourless and simple or rarely faintly 1-septate; the asci are 8- or more- sometimes 6-spored, excepting in the section *Mycoblastus*, which contains one species with a 1- or 2-spored ascus. The term *biatorine*, from *Biatora*, has been applied to those apothecia that are lighter in colour and soft in texture, while *lecideine* signifies the dark almost black fruits that are carbonaceous and hard, and that belong more particularly to the *Eulecideæ*. There is, however, no clear line of demarcation, as the colour and form of the fruits change with age. The genus is very well represented in our islands, where a considerable number of species seem to be endemic. The chemical reactions, which have been given as far as possible, will be found to be useful in distinguishing plants which otherwise might readily be confounded. The species have been grouped in four sections distinguished by thalline or apothecial characters. In the first three sections occur variable species that might be listed in either of the other two.

Thallus distinctly squamulose § i. PSORA (1-16).

Thallus variously crustaceous.

Ascus 8-spored.

Apothecia lighter in colour § ii. BIATORA (17-82).

Apothecia dark and carbonaceous § iii. EULECIDEA (83-209).

Ascus 1- or 2-spored.

Apothecia dark § iv. MYCOBLASTUS (210, 11).

§ i. PSORA Haller Hist. Stirp. Helv. iii. 93 (1768) et auctt., pro parte. (Pl. 4.) Thallus squamulose; spores 8 in the ascus. Spermatogones with simple sterigmata and straight spermatia.

1. *L. lurida* Ach. Meth. 77 (1803) & Syn. 51 (1814).-- Thallus imbricate, appressed, dull- or dark-brown (K —, CaCl—); the squamules orbicular, rigid, sinuate-lobed, dark beneath. Apothecia superficial on the squamules, adnate, plane, brownish-black, the margin obtuse, slightly flexuose, becoming convex and immarginate; hypothecium thick, dark-brown; paraphyses stout, coherent, reddish-brown at the apices; spores ellipsoid or oblong-ellipsoid, 13-15 μ long, 5-7 μ thick; hymenial gelatine slightly bluish then wine-red with iodine.— Hook. Fl. Scot. ii. 40; Carroll in Nat. Hist. Rev. vi. 525; Cromb. Lich. Brit. 64; Leight. Lich. Fl. 252; ed. 3, 244. *Lichen luridus* Sw. in Nov. Act. Upsal. iv. 247 (1784); Dicks. Crypt. fasc. ii. 20; With. Arr. ed. 3, iv. 28; Engl. Bot. t. 1329. *Lepidoma luridum* S. F. Gray Nat. Arr. i. 460 (1821). *Psora lurida* DC. Fl. Fr. ii. 370 (1805); Mudd Man. 170. *Lichenoides pulmonarius saxatilis viridis*, etc., Dill. Hist. Muse. 228, t. 30. f. 134 (1741).

Exsicc. Dicks. Hort. Sicc. n. 25; Cromb. n. 79; Johns. n. 423; Larb. Cæsar. n. 31; Lich. Hb. n. 340.

The squamules vary considerably in size up to 5 mm. across. When sterile and only spermogoniiferous it might readily be taken for a *Dermatocarpon* allied to *D. hepaticum* Ach. In more shady situations the thallus is occasionally pale-brown, with the squamules more concrete, when it is form *pallescens* (Th. Fr. Lich. Scand. 414 (1874)), a condition which rarely occurs in this country. The apothecia are generally rather scattered and in age become black.

Hab. On calcareous soil among rocks in maritime and upland districts.—*Distr.* Here and there in Great Britain and the Channel Islands, though plentiful where it occurs; not seen from Ireland.—*B. M.* St. Ouen's Bay and Portelet Bay, Jersey; Saints' Bay, Guernsey; above Anstey's Cove, Torquay, Devon; Yatton, Herefordshire; Cheddar Cliffs and Bathford Hill, Somerset; Cunning Dale, near Buxton, and above Cromford, Derbyshire; Dolgelly, Merioneth; near Ingleton, Yorkshire; Great Orme's Head, Carnarvonshire; Teesdale and Egglestone, Durham; Mallerstang and Scout Scar, Westmorland; Cumberland; King's Park, Edinburgh; Island of Lismore, Argyll; Ben Lawers, Perthshire; Clova Mts., Forfar; Craig Guie, Braemar, Aberdeenshire.

Form *sorediza* Johns. N. Engl. Lich.-Herb. n. 424 (1910). Thallus and margins of squamules more or less sorediate or eroded.

Exsicc. Johns. n. 424.

Hab. On limestone rocks.—*B.M.* Beside the river Greta, Yorkshire.

2. *L. globifera* Ach. Lich. Univ. 213 (1810).—Thallus imbricate, somewhat shining, areolate, reddish-brown or chestnut-red (K —, CaCl —); squamules reniform, rigid, roundly lobed, flexuose, subhorizontal, pale beneath. Apothecia small, prominent, convex, at length globose, immarginate, often conglomerate, brown or brownish-black; paraphyses coherent, reddish-brown at the apices; hypothecium thin, brownish; spores subellipsoid, 12–15 μ long, 5–6 μ thick; hymenial gelatine slightly bluish then wine-red with iodine.—Cromb. Lich. Brit. 64; Leight. Lich. Fl. 250; ed. 3, 241. *Psora globifera* Massal. Lich. Ric. 91 (1852); Mudd Man. 170.

Differs from the preceding in the usually smaller, more ascending, red-brown rugulose squamules, and the more elevated, globose, often aggregate apothecia. According to Th. Fries (Lich. Scand. 411, 412) the squamules are rarely more or less white-suffused and the apothecia usually violaceo-pruinose, neither of which characters is apparent in the few, chiefly fragmentary, British specimens.

Hab. On the ground in crevices of rocks in hilly and mountainous regions.—*Distr.* Found only very sparingly in W. England, N. Wales, S. Scotland, and on the S. Grampians.—*B. M.* Greba Mt., Isle of Man; Dolgelly, Merioneth; Levens Park, Westmorland; Arthur's Seat, Edinburgh; Ben Lawers, Perthshire.

3. *L. rubiformis* Wahlenb. Fl. Lapp. 479 (1812).—Thallus squamulose, imbricate, pale-sordid-brownish (K —, CaCl —);

squamules ascending, small, firm, subreniform, usually white and crenate at the margins, white beneath. Apothecia small, adnate, convex, immarginate, often aggregate, blackish or slightly æruginose-suffused; hypothecium pale-brownish; paraphyses concrete, reddish at the apices; spores ellipsoid or oblong, $21-17\ \mu$ long, $5-7\ \mu$ thick; hymenial gelatine bluish then sordid with iodine.—Carroll in Journ. Bot. iii. 289 (1865); Cromb. in Grevillea xxii. 9. *L. globifera* var. *rubiformis* Cromb. Lich. Brit. 64 (1870); Leight. Lich. Fl. 250; ed. 3, 241. *Botomyces rubiformis* Wahlenb. in Ach. Meth. 324, t. 7. f. 5 (1803). *Lichen rubiformis* Sm. Engl. Bot. t. 2112 (1810)? *Lepidoma rubiformis* S. F. Gray Nat. Arr. i. 461 (1821). *Psora rubiformis* Hook. in Sm. Engl. Fl. v. 193 (1833); the description "apothecia hollow, red" applies apparently to a different species referable to *Cladonia* (cf. Mudd Man. 62). The specimen figured in Engl. Bot. is not among Sowerby's plants; and I have been unable to find it in Smith's herbarium at the Linnean Society.

Intimately related to *L. globifera*, of which it is probably only a variety, differing chiefly in the lighter-coloured thallus and the slightly larger spores. It is often caespitose with the squamules nearly erect (*vide* Th. Fries Lich. Scand. 413 (1874)), a character not distinctly marked in our two small specimens. The constantly convex apothecia are often conglomerate, presenting, as Wahlenberg says, the appearance of the fruit of *Rubus cvesius*.

Hab. On the ground in crevices of rocks in an alpine situation.—*B. M.* Ben Lawers, Perthshire.

4. *L. rhizobola* Nyl. in Flora xlviii. 4 (1865).—Thallus squamulose, appressed-imbricate, chestnut- or dull-brown (K —, CaCl —); squamules moderate in size, rigid, rounded or difform, crenate at the margins, pale or whitish beneath, unequal, with long central rhizoids. Apothecia moderate, convex, blackish; hypothecium pale-brownish; paraphyses not well discrete; spores oblong-ellipsoid, $12-16\ \mu$ long, $6-7\ \mu$ thick; hymenial gelatine wine-red with iodine. —Carroll in Journ. Bot. iii. 289 (1865); Cromb. Lich. Brit. 64; Leight. Lich. Fl. 251; ed. 3, 242.

Distinguished by the distinct whitish rhizoids. The British specimens are but sparingly fertile: the one from Kentmere is very imperfect.

Hab. On the ground among rocks in alpine situations.—*B. M.* Kentmere, Westmorland; Ben Lawers, Perthshire.

5. *L. testacea* Ach. Meth. 80 (1803) & Syn. 51 (1814).—Thallus appressed, squamulose, greenish- or livid-grey, or greyish-yellow (K —, CaCl —); squamules rigid, subimbricate, undulate-crenate, white beneath and at the margins. Apothecia moderate, sessile, convex, orange-red or testaceous; paraphyses subdiscrete, orange or tawny at the apices; hypothecium colourless; spores

ellipsoid, 10–13 μ long, 5–7 μ thick; hymenial gelatine bluish then sordid-violet with iodine.—Cromb. in Grevillea xxii. 9 (1893). *Psora testacea* Hoffm. Pl. Lich. i. 99, ff. 5, 6 (1790). *Lichen saxifragus* Sm. in Trans. Linn. Soc. i. 82, t. 4. f. 4 (1791). *Lepidoma testaceum* S. F. Gray Nat. Arr. i. 461 (1821).

Resembles a *Lecanora* of the subgenus *Squamaria*, near *L. crassa*, but is a true *Lecidea*. The apothecia in a very young state are plane with paler margin, but when more advanced become convex and immarginate. The spermatogones, not visible in our specimen, are pale, with the sterigmata simple, rarely 2–3-septate, and spermatia cylindrical, straight, 7 μ long, 1 μ thick (*vide* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 350 (1856)).

Hab. On calcareous rocks in an upland hilly district.—Reported from Cleve Hill, Somerset.

6. *L. glaucolepidea* Nyl. in Mém. Soc. Cherb. v. 337 (1857) (nomen); Carroll in Nat. Hist. Rev. vi. 526, t. 32. ff. 2, 3 (1859).—Thallus effuse, membranaceous, squamulose, glaucous-green (Kf + yellow, CaCl —); squamules small, contiguous or somewhat scattered, ascending, rounded, inciso-lobed, and often greyish-sorediate at the margins, pale below. Apothecia adnate, moderate in size or somewhat large, convex, immarginate, reddish-brown or blackish; hypothecium thick, pale-brown; paraphyses coherent; spores ovoid or oblong, 12–16 μ long, 5–7 μ thick; hymenial gelatine bluish then sordid with iodine.—Cromb. Lich. Brit. 63; Leight. Lich. Fl. 251; ed. 3, 243. *Psora glaucolepidea* Mudd Man. 171, t. 3. f. 62 (1861).

When sterile might readily be taken for the basal thallus of a *Cladonia* near *C. delicata*. In this condition as regards colour and mode of growth it resembles *Normandina*, but differs in the form of the squamules and their sorediiferous margins. The apothecia, sparingly present, are in their young state plane and margined, the margin speedily becoming obsolete.

Hab. On peaty ground in mountainous regions.—*Distr.* Only a few localities in N.W. England, the S. and Central Grampians, Scotland, S.W. and N.E. Ireland.—*B. M.* Mardale, Westmorland; Glen Falloch and Rannoch, Perthshire; near Ballintoy, Antrim.

7. *L. Friesii* Ach. in Liljeb. Sv. Fl. 610 (1816).—Thallus effuse, squamulose, granulose, cervine or cervine-yellow (K —, CaCl —), the squamules small, rotundate, inflexed, convex-gibbous, at times plicate, smooth and shining. Apothecia small, sessile, black, naked, plicate-crispate, the margin thin, persistent; paraphyses concrete, hypothecium dark-brown; spores ellipsoid, 7–8 μ long, 3–4 μ thick; hymenial gelatine pale-bluish with iodine.—Leight. in Ann. Mag. Nat. Hist. xiv. 404, t. ix. ff. 8, 9, 11 (1864) & Lich. Fl. 253; ed. 3, 245; Cromb. Lich. Brit. 92. *Psora caradocensis* Mudd Man. 169 pro parte, t. 3, f. 61 (1861).

Exsicc. Mudd n. 142.

Somewhat similar to and at first sight apt to be taken for *Bilimbia caradocensis*, but distinguished by its thallus and spores. The British plants seen are only sparingly fertile; the spermatogones, rarely present, are verruciform, black, scattered or conglomerate, with spermatia oblong or subcylindrical, straight, about $3\ \mu$ long.

Hab. On decorticated trunks of oak and on old palings, in an upland district.—*Distr.* Very local in N. England, but probably to be detected elsewhere.—*B. M.* Mendlesham, Suffolk; Boysdale, Cleveland and Farndale, Yorkshire; near Perth.

8. *L. prostratula* Stirt. in Scott. Nat. v. 218 (1880).—Thallus pale or pale pinkish-grey, thin, squamulose, on a black hypothallus (K —, CaCl + reddish); the squamules appressed, plane, scattered or contiguous, rounded, the margins lighter in colour and sometimes crenulate. Apothecia brownish-black, plane, marginate, becoming convex and almost immarginate; hypothecium brownish-black, thick; paraphyses distinct but conglomerate at the black clavate apices; spores ellipsoid, $9\text{--}12\ \mu$ long, $5\text{--}6\ \mu$ thick; hymenial gelatine slightly bluish then wine-red with iodine.—*A. L. Sm. Monogr. Brit. Lich. i. 468.*

A delicate dainty species; the squamules, less than 1 mm. across, contrast strikingly with the black hypothecium and the dark apothecia, which are rather over $\frac{1}{2}$ mm. across. Collected by Stirton, Sept. 1874.

Hab. On rocks.—*B. M.* Craig Var. Kinloch Rannoch, Perthshire.

9. *L. ostreata* Schaer. Spicil. 110 (1828).—Thallus effuse, squamulose, glaucous or pale-olive (K —, CaCl + dark-crimson), the squamules imbricate, reniform, crowded or scattered, ascending or suberect, smooth, crenate, the under side and margins usually white-pulverulent. Apothecia moderate, scattered, basal on the squamules, black, slightly glaucous-pruinose, the margin thin, at length flexuose; hypothecium thick, brownish-black; paraphyses concrete, colourless, yellowish in the mass; spores ellipsoid or fusiform, simple, small, $10\text{--}12\ \mu$ long, $2.5\text{--}3.5\ \mu$ thick; hymenial gelatine bluish with iodine.—*Cromb. Lich. Brit. 91; Leight. Lich. Fl. 253; ed. 3. 245. Psora ostreata Hoffm. Deutschl. Flora ii. 163 (1795); Mudd Man. 169. P. scalaris Hook. in Sm. Engl. Fl. v. 192 (1833). Lichen scalaris Ach. in Vet. Ak. Handl. 1795. 127, t. 5. f. 1; Dicks. Crypt. fasc. iv. 24; Sm. Engl. Bot. t. 1501 (1805). Lepidoma scalare S. F. Gray Nat. Arr. i. 461 (1821).*

Exsicc. *Cromb. n. 188; Leight. n. 50; Mudd n. 141.*

When sterile might readily be taken for var. *ostreata* of *Cladonia macilenta* (as noted by Crombie), but may be distinguished from this by the different chemical reaction of the thallus. It spreads extensively over the substratum, the squamules being either plane or slightly convex. The apothecia in this country are apparently extremely rare and occur on a few of our specimens.

Hab. On old palings, occasionally on trunks of trees, very rarely erratic on sandstone, in lowland and upland situations.—*Distr.* Some-

what rare in England, but plentiful where it occurs.—*B. M.* Henham, Suffolk; Hampstead and near Hendon, Middlesex; Keston, Kent; near Reigate, Surrey; Ardingly (saxicolous), Sussex; New Forest, Hants; Totteridge and near Elstree, Herts; Hoe Street, Walthamstow, Gosfield Hall and Brentwood, Essex; near Ampthill, Bedfordshire; Twycross, Leicestershire; Hay Park, Herefordshire; near Worcester and Little Malvern, Worcestershire; Harboro' Magna, Warwickshire; Haughmond Hill, the Wrekin and Church Stretton, Shropshire; Westerdale and Stagdale, Cleveland, Yorkshire.

Var. *myrmecina* Nyl. Lich. Scand. 243 (1861).—Thallus with the squamules tawny- or chestnut-brown. Apothecia naked. —*Lecidea scalaris* var. *myrmecina* Ach. Meth. 78 (1803).

Differs merely in the colour of the thallus and in the constantly naked apothecia. In the single British specimen, which is only very sparingly fertile, the squamules are nearly erect.

Hab. On a decorticated stump of an old oak in a wooded upland situation.—*B. M.* Bramble Hill, New Forest, Hants.

10. *L. acutula* Nyl. in Flora lxxix. 100 (1886).—Thallus effuse, thin, granular-squamulose, greyish-green or greyish-brown (K —), the squamules minute, subimbricate, somewhat convex and difform. Apothecia small, thin, black, margined, often angulose and subpubescent, the margin thin, somewhat acute; paraphyses subdiscrete; epithecium and hypothecium olive-brownish-black; perithecium dark (K + obsoletely purplish); spores fusiform, 12–15 μ long, 2.5–3.5 μ thick; hymenial gelatine not tinged but the asci wine-reddish with iodine.

Distinguished from *L. ostreata* by the closely packed gibbous squamules.

Hab. On bark of pine in upland situations.—*B. M.* Penrith Beacon, Cumberland. (Specimen also received from Bouly de Lesdains, N. France.)

11. *L. decipiens* Ach. Meth. 80 (1803).—Thallus indeterminate, squamulose, appressed, reddish or pale-flesh-coloured, white beneath; the squamules more or less scattered, subflexuose or subcrenate, and often whitish at the margins (K —, CaCl —). Apothecia marginal, adnate, plane or convex, blackish, the margin thin, entire, at length evanescent; hypothecium pale-brown; paraphyses concrete, brown towards the apices; spores ovoid or ellipsoid, 12–16 μ long, 5–6 μ thick; hymenial gelatine bluish with iodine.—Cromb. Lich. Brit. 76; Leight. Lich. Fl. 249; ed. 3, 240; Hook. Fl. Scot. ii. 41. *Lichen decipiens* Ehrh. in Hedw. Stirp. Crypt. ii. 7 (1789); Dicks. Crypt. fasc. ii. 21; With. Arr. ed. 3, iv. 26; Engl. Bot. t. 870. *Lepidoma decipiens* S. F. Gray Nat. Arr. i. 462 (1821). *Psora decipiens* Hook. in Sm. Engl. Fl. v. 193 (1833); Mudd Man. 171.

Exsicc. Leight. n. 334.

An earlier designation, *Lichen pezizoides*, had been given to this lichen by Swartz (N. Act. Ups. iv. 247 (1784)), but that name had

already been appropriated by Weber for another plant (Spicil. 200, 1778). See Monogr. Brit. Lich. Part i. 86 (1918).

It is easily recognized by the peculiar colour of the thallus. The squamules are at first discrete and concave, when the plant has much the aspect of a *Peziza*, but become plane and at length subimbricate. Their margins are at times persistently whitish (form *albomarginata* Müll. Arg. in Flora lxiv. 88 (1881), Cromb. in Grevillea xxii. 59). In age the thallus becomes more or less whitish and subpruinose (form *cretacea* Müll. Arg. in Bull. Soc. Murith. fasc. x. 55, 1881). The spermatogones not unfrequently have bacillar spermatia, 5-6 μ long, 8 μ thick (*vide* Nyl. Lich. Env. Par. 77). Our British specimens are for the most part well fertile.

Hab. On cretaceous and calcareous soil in hilly and mountainous districts.—*Distr.* Only a few localities in England, N. Wales, and the Highlands of Scotland; not seen from Ireland.—*B. M.* Epsom Downs, Surrey; Newhaven, Sussex; Winscombe and Bruton, Somerset; Gogmagog Hills, Cambridge; Great Orme's Head, Carnarvonshire; Teesdale, Durham; Kentmere and Helsington, Westmorland; I. of Lismore, Argyll; Craig Calliach and Ben Lawers, Perthshire; Clova Mts., Forfar.

12. *L. confertula* Stirton in Trans. Glasgow Soc. Nat. 86 (1875).—Thallus pallid-cinereous, crustaceous, squamulose, the squamules small, contiguous or dispersed (K —, CaCl —). Apothecia dark-brown, minute, numerous, nearly plane with an obtuse margin, often contiguous; hypothecium colourless; paraphyses almost coherent, clavate and brown at the apices, spores ellipsoid, 10-13 μ long; hymenial gelatine blue then reddish-violet with iodine especially the asci.—Leight. Lich. Fl. ed. 3, 243. First collected at Killiecrankie, Perthshire.

Hab. On rocks.—*B. M.* Near Cwm Bychan, Merioneth; High Seat, near Keswick, Cumberland.

13. *L. hypocyanea* Stirton in Scott. Nat. v. 218 (1880).—Thallus pale-grey, wrinkled, congested-squamulose. Apothecia brown or brownish-black, minute (2-4 mm. wide), convex, immarginate, aggregate or in clusters (up to 30 glomerulate); hypothecium red, the subhymenial stratum thickish, bluish or intensely blue; paraphyses conglutinate at the apices, not clavate; asci saccate; spores ellipsoid, 9-12 μ long, 6-7 μ thick. A. L. Sm. Monogr. i. 468 (1918).

Stirton found that the blue colour was lacking here and there.

Hab. On soil in a mountainous region.—*B. M.* Foot of Ben Lawers, Perthshire.

14. *L. sporeta* Stirton in Scott. Nat. iv. 166 (1877).—Thallus whitish, squamulose, the squamules minute, dispersed, plane or somewhat convex and sometimes crenulate (K —, CaCl —). Apothecia small, brownish-black, crowded, adnate, plane, obtusely margined, somewhat shining; hypothecium colourless; paraphyses not well discrete, brown at the apices; spores ellipsoid, 11-15 μ long, 5-6 μ thick; hymenial gelatine blue then brownish with iodine.—Leight. Lich. Fl. ed. 3, 244.

Hab. On rocks.—*B. M.* Ben More, Island of Mull.

15. *L. Wallrothii* Floerke ex Spreng. Neue Entdeckung. ii. 96 (1821).—Thallus effuse, thickish, appressed, granulose-squamulose, whitish or glaucous, the granules more or less scattered, or usually congested and confluent, and squamulose at the margins (K + yellow, K(CaCl) + red). Apothecia appressed, moderate in size or rather large, plane or convex, pale- or dark-brown, subpruinose, the margin paler, thin, inflexed; hypothecium pale; paraphyses slender; spores ellipsoid, 18–21 μ long, 9–11 μ thick; hymenial gelatine bluish then sordid wine-red with iodine.—Cromb. in Grevillea xxii. 9. *L. glebulosa* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 357 (1856); Cromb. Lich. Brit. 66 (1870). *L. Salweii* Borr. in Engl. Bot. Suppl. t. 2861 (1834); Leight. Lich. Fl. 249; ed. 3, 241. *Biatora glebulosa* Fr. Lich. Eur. 252 (1831) (excl. syn. Engl. Bot. t. 1955).

Exsicc. Cromb. n. 170; Larb. Cæsar. n. 32; Lich. Hb. n. 303.

A very distinct species, easily recognized by the spreading sub-squamulose thallus and slightly pruinose apothecia, which distinguish it from all states of *L. granulosa*, to which it is somewhat similar. The apothecia, at first plane and thinly margined, become at length convex, several confluent and immarginate.

Hab. On the ground in crevices of rocks in maritime, rarely mountainous districts.—*Distr.* Rather local, though usually plentiful where it occurs in the Channel Islands, S.W. England and Wales.—*B. M.* Beaufort Bay and the Warren, Noirmont, Jersey; Saint's Bay, Guernsey; Valley of Rocks, Lynton, Devon; near Bodmin, St. Michael's Mount, Hensborrow, and near Penzance, Cornwall; near Fishguard, Pembrokeshire; banks of the Teify, Cardiganshire.

16. *L. demissa* Ach. Meth. 81 (1803) & Th. Fries Lich. Scand. 420 (1874).—Thallus subdeterminate, adnate-squamulose, greenish-brown or dingy-greyish, the squamules smooth, verrucose-tumid or subimbricate (K —, CaCl —); hypothallus black. Apothecia small or moderate in size, adnate, plane or convex, reddish-brown or blackish, the margin thin, soon obliterated; hypothecium colourless; paraphyses stoutish, incrassate and brown at the apices; spores ellipsoid, 10–17 μ long, 6–8 μ thick; hymenial gelatine deep-blue with iodine.—*L. atrorufa* Ach. Meth. 74 (1803) & Lich. Univ. 200; Carroll in Journ. Bot. iv. 23 (1866); Cromb. Lich. Brit. 67; Leight. Lich. Fl. 250; ed. 3, 242. *Lichen demissus* Rutstr. Diss. Pl. Crypt. 8 (1794). *L. atrorufus* Dicks. Crypt. fasc. iv. 22, t. 12. f. 4 (1801); Engl. Bot. t. 1102. *Lepidoma atrorufum* S. F. Gray Nat. Arr. i. 461 (1821). *Psora atrorufa* Hook. in Sm. Engl. Bot. v. 192 (1833); Mudd Man. 171.

Exsicc. Cromb. n. 171; Johns. n. 335.

The thallus varies somewhat in colour according to the situation, the black hypothallus giving a very dark aspect, especially on peaty soil. The squamules may form an almost continuous crust, or, in

age, may be broken up and warted-granular in the centre. The apothecia, usually somewhat scattered, are occasionally confluent and difform.

Hab. On peaty and gravelly soil, very rarely on naked schistose boulders in mountainous regions.—*Distr.* Only in N. England, Wales and on the Grampians, Scotland; not certainly found in Ireland, though reported from Wicklow.—*B. M.* Cader Idris and Rhinog Fach, Merioneth; Snowdon, Carnarvonshire; Farndale Moor, Yorkshire; Staveley Head, Westmorland; Teesdale, Durham; Ben Cruachan, Argyll; Ben Lawers, near Loch Erich and Craig Calliach, Perthshire; Lochnagar, Ben-naboord and Ben Macdhui, Braemar, Aberdeenshire; Ben Nevis, Invernessshire.

§ ii. *BIATORA* Fr. in Vet. Ak. Handl. 1822, 263; Nyl. in Mém. Soc. Sci. Cherb. ii. 182 (1855). (Pl. 5.)

Thallus very variable, at times almost obsolete. Apothecia plane or convex, brightly coloured, biatorine, partly or very rarely entirely black; asci usually 8-spored; spores simple, colourless. Spermatogones with simple rarely septate sterigmata and straight very rarely arcuate spermatia.

As distinguished from the following Sect. *Eulecidea*, the apothecia in Sect. *Biatora* are lighter in colour, especially in the early stages; in many of the species they become dark with age. The colour of the epithecium, rarely dark-brown, is never quite black. The species have been grouped as far as possible in related series, but a final arrangement except on artificial lines is, as yet, impracticable.

17. *L. cinnabarina* Sommerf. in Vet. Ak. Handl. 115 (1823).—Thallus effuse, thin, smooth or leprose-granulose, whitish (K + yellowish, CaCl —). Apothecia adnate or appressed, somewhat plane and obtusely margined, then convex and immarginate, cinnabarine-reddish; paraphyses coherent; epithecium reddish (K + rose-coloured); hypothecium colourless; spores oblong or fusiform, small, 8–12 μ long, 2–3 μ thick; hymenial gelatine, especially the asci, bluish with iodine.—Cromb. in Grevillea xxii. 9.

A very distinct species, readily distinguished by the colour of the apothecia. The thallus, which may spread extensively, is sprinkled with whitish, pulvinate soredia. It is one of our rarest lichens, only two fertile British specimens having been gathered, though the sterile thallus may not be uncommon in the district cited.

Hab. On the smooth bark of old stunted birches in a wooded mountainous region.—*B. M.* Mar Forest, Braemar, Aberdeenshire (the only British locality).

18. *L. lucida* Ach. Meth. 74 (1803).—Thallus effuse, thin, leprose, rarely granulose, yellow, citrine-yellow or yellowish-green (K —, CaCl —). Apothecia minute, scattered, plane or convex, very thinly margined or immarginate, pale lemon-yellow; spores oblong-ovoid or narrowly obovate, simple, colourless, minute, 4–6 μ long, 2–2.5 μ thick; hypothecium colourless; paraphyses stoutish, coherent; epithecium granulose; hymenial gelatine

bluish then wine-red with iodine.—S. F. Gray Nat. Arr. i. 475; Hook. Fl. Scot. ii. 40 & in Sm. Engl. Fl. v. 185; Mudd Man. 193; Cromb. Lich. Brit. 65; Leight. Lich. Fl. 258; ed. 3, 254. *Lichen lucidus* Ach. Prodr. 39 (1798); Engl. Bot. t. 1550.

Exsicc. Johns. n. 331; Larb. Cæsar. n. 36; Lich. Hb. n. 306; Leight. n. 385.

Easily recognized among the allied species by the colour of the thallus and of the apothecia. When sterile, as is very frequently the case in this country, the thallus has a superficial resemblance to that of *Coniocybe furfuracea*, for which it might be mistaken. The bright colour is due to the presence of rhizocarpic acid in the thallus. When lignicolous it is var. *theiotea* Ach. in Vet. Ak. Handl. 1808, 270; Cromb. in Grevillea i. 172; Leight. Lich. Fl. ed. 3, 255; and when terricolous and herbicolous it is var. γ *satura* Ach. (*fide* Th. Fries Lich. Scand. 432 (1874)). These, however, are mere states, both of which seem to be very rare in Great Britain. The apothecia are usually somewhat scattered. Frequently the host of *Calicium arenarium*.

Hab. On shady rocks and walls, seldom on decaying trunks of trees and grasses on the ground, in lowland and upland situations.—*Distr.* General and not uncommon in England, rare in Scotland and the Channel Islands; not seen fertile in Ireland (*fide* Carroll).—*B. M.* Rozel, Jersey; Guernsey; Ightham, Kent; Dawlish and near Chagford, Devon; Trellick, Monmouthshire; Knightsford Bridge, Worcestershire; Llanderfel, near Bala, Cader Idris and Barmouth, Merioneth; Oswestry, Shropshire; Ayton Moor, Cleveland, Yorkshire; near Staveley, Kendal, Westmorland; Keswick, Cumberland; New Galloway, Kirkcudbright; Glen Creran, Argyll; Craigforth, near Stirling; Falls of Tummel and Glen Fender, Blair Athole, Perthshire; Killarney, Kerry.

19. *L. clavulifera* Nyl. in Flora lii. 294 (1869) & lxiv. 539 (1881).—Thallus effuse, thin, granulate or subleprose, the granules often somewhat scattered, white, greyish-green or yellowish-green (K —, CaCl —). Apothecia minute, convex, immarginate, sordid-ochraceous or testaceous-red, blackish or black; paraphyses coherent; epithecium and hypothecium pale; spores oblong or clavate, very minute, 4–6 μ long, 1 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Cromb. in Grevillea vi. 115; Leight. Lich. Fl. ed. 3, 255.

A variable plant as to the colour of the thallus and apothecia; it is, however, well characterized by the minute, clavate spores. The gonidia are small and minutely clustered. In Lapland, where it was originally gathered, it is corticolous. In our saxicolous specimens the thallus is very thin and more or less scattered. The apothecia are numerous and constantly convex.

Hab. On shady rocks and stones of walls in an upland situation.—*B. M.* Near Clifden, Connemara, Galway.

Form *subviridicans* Nyl. in Flora lx. 463 (1877).—Thallus greenish. Apothecia and spores as in the species.—Cromb. in Grevillea vi. 115; Leight. Lich. Fl. ed. 3, 255 (errore *subviridans*).

Exsicc. Larb. Lich. Hb. n. 29.

Apparently only a state, owing its greener colour to the place of growth. The single specimen seen is but sparingly fertile.

Hab. On rocks in cave in a mountainous district.—*B. M.* Doughruagh Mt., Connemara, Galway (the only locality).

20. *L. tenera* Nyl. in *Flora* lii. 83 (1869).—Thallus effuse, thin, unequal or subgranulate, greyish-green or yellowish (K + yellow, CaCl —). Apothecia scattered, minute, plane, light-coloured, thinly white-margined, becoming convex, the margin disappearing; hypothecium colourless; paraphyses scanty, incrassate or clavate at the apices, the epithecium colourless; spores oblong, simple or obsoletely 1-septate, narrow, 8–10 μ long, 1.5–2.5 μ thick, hymenial gelatine bluish with iodine.—Cromb. in *Journ. Bot.* vii. 232 (1869) & *Lich. Brit.* 70; Leight. *Lich. Fl.* 259. *Lecanora tenera* Cromb. in *Grevillea* iii. 82 (1874); Leight. *op. cit.* ed. 3, 188.

Exsicc. Cromb. n. 68; *Larb. Lich. Hb.* nos. 18, 93.

Resembles *Lecanora* in the pseudo-lecanoroid margin of the apothecium, which is, however, destitute of algal cells. It spreads extensively, but is rarely well fertile. Occasionally the thalline granules are depressed and more or less dispersed (form *explanatula* Leight. *op. cit.*, ed. 3, l. c.). Spermatogones are frequent, colourless, with oblong spermatia 4–5 μ long, 1.5 μ thick.

Hab. On shady rocks, granitic and quartzose in maritime tracts.—*Distr.* Found only in the Channel Islands, N.E. Scotland and N.W. Ireland.—*B. M.* La Moye and Boulay Bay, Jersey; near Bay of Nigg, Kincardineshire; Letterbeg, Connemara, Galway.

21. *L. querneæ* Ach. *Meth.* 62 (1803).—Thallus determinate or effuse, thinnish or submoderate, minutely granulate-pulverulent, yellowish or yellowish-green or pale brownish-yellow (K + yellow, CaCl + orange-red). Apothecia submoderate, scattered, subimmersed, slightly convex, immarginate, reddish-brown or dark-red; paraphyses coherent; hypothecium pale; spores ellipsoid, 8–12 μ long, 5–7 μ thick; hymenial gelatine bluish then sordidly tawny-wine-coloured with iodine.—S. F. Gray *Nat. Arr.* i. 469; Hook. in *Sm. Engl. Fl.* v. 180; Tayl. in *MacKay Fl. Hib.* ii. 126; Cromb. *Lich. Brit.* 65; Leight. *Lich. Fl.* 264; ed. 3, 262. *Lichen querneus* Dicks. *Crypt. fasc.* i. 9, t. 2. f. 3 (1785); *Engl. Bot.* t. 485; With. *Arr.* ed. 3, iv. 11. *Pyrrhospora querneæ* Koerb. *Syst. Lich. Germ.* 209 (1855); *Mudd Man.* 192, t. 3. f. 75 (1861).

Exsicc. Bohl. n. 84; Carroll *Lich. Hib.* n. 14; *Larb. Cæsar.* n. 37; Leight. n. 61.

A well-marked species, which at first sight might be taken for a biatorine condition of some plant allied to *Lecanora varia*. It has been referred to the genus *Pyrrhospora* on account of the spores being at times reddish-brown; this colour (as in other instances) is visible only in dead ones which have remained long in the asci (Th. Fries *Lich. Scand.* 426). The thallus, often sterile, usually spreads extensively over the substratum, but at times is limited by a black hypothalline

line. The apothecia are more or less scattered, becoming somewhat difform in age.

Hab. On the trunks of old trees, chiefly oaks, in wooded upland districts.—*Distr.* Not uncommon in most parts of England, rare in N. Wales, Ireland, and the Channel Islands; not seen from Scotland.—*B. M.* Rozel, Island of Jersey; Ickworth, Suffolk; Epping Forest and Hadleigh Woods, Essex; Shere, Surrey; Wrotham, Kent; Clayton, Withyham, Henfield, Wakehurst Park, Tilgate and St. Leonard's Forest, Sussex; New Forest, Hants; Torquay, Lustleigh and near Kingskerswell, Devon; Downton, Wilts; Oakley Park, near Cirencester, Gloucestershire; near the Lodge, Herefordshire; Crowle Road, near Worcester and Ledbury, Worcestershire; Garn Dingle, Denbighshire; Aston, Warwickshire; Royston Hill, The Wrekin, Gobowen, and Buildwas, Shropshire; Easby Wood, Cleveland, Yorkshire; near Bishop Auckland, Durham; Antrim; Castle Bernard Park and near Riverstown, Cork; Glandarry Wood and Dugort, Achill Island; Deer Park, Killarney, Kerry; near Belfast, Antrim.

22. **L. Henrica** Larb. ex Nyl. in Flora lx. 563 (1877).—Thallus white, tartareous, thickish, continuous, smooth, slightly rimulose (K + yellow, CaCl + yellow). Apothecia pale-yellow-flesh-coloured, scattered, sessile, plane or convex, with an obtuse margin or almost immarginate; hypothecium colourless; paraphyses distinct, stout, colourless at the apices; spores 4, 6 or 8 in the ascus, ellipsoid or fusiform-ellipsoid, 15–20 μ long, 6–7 μ thick; hymenial gelatine blue then yellowish, the asci violet-yellow, with iodine. Spermatia arcuate, 18–22 μ long, 5 μ thick.—Cromb. in Grevillea vi, 111; Leight. Lich. Fl. ed. 3, 298.

Exsicc. Larb. Lich. Hb. n. 171.

A specimen from New Galloway agrees with the above except that the apothecia are crowded and sublobate and the spores smaller (12 $\mu \times 6 \mu$), but they are somewhat immature.

Hab. On rocks in shady localities. *B. M.* New Galloway, Kircudbright; ravine near Kylemore, Connemara, Galway.

23. **L. phæops** Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iv. 5 (1858).—Thallus tartareous, determinate, thickish, smooth, continuous, irregularly rimulose, white or greyish-white (K + yellowish, CaCl —); hypothallus whitish. Apothecia small, innate, angulose, plane, immarginate, brown or reddish-brown; paraphyses slender, crowded, slightly reddish; hypothecium reddish; spores fusiform-ellipsoid, 9–17 μ long, 5–6 μ thick; hymenial gelatine deep blue with iodine.—Salw. in Trans. Bot. Soc. Edin. vii. 554; Cromb. Lich. Brit. 65; Leight. Lich. Fl. 296. *Lecanora phæops* Th. Fr. Lich. Scand. 287 (1874); Leight. Lich. Fl. ed. 3, 181.

Exsicc. Larb. Lich. Hb. n. 17.

Frequently classified under *Lecanora* sect. *Aspicilia* near to *L. lacustris*, which it resembles in the innate apothecia and in the smooth thallus largely due, as in *L. lacustris*, to the habitat. From the general habit and structure it agrees more nearly with the *Biatoras*. The

apothecia, numerous but scattered, are in a very young state thinly margined and vary in size from subminute to submoderate, in which latter case it is forma *major* Cromb. in Leight. *l. c.*

Hab. On rocks, chiefly schistose, inundated or near water, in mountainous regions.—*Distr.* Only in Wales, on the Grampians, Scotland, and in W. Ireland.—*B. M.* Cader Idris, Merioneth; Plinlimmon, Cardiganshire; Nant Francon, Llyn Clwyd and Snowdon, Carnarvonshire; Ben Cruachan, Argyll; Craig Calliach and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Mangerton, Kerry; Delphi and Doughruagh Mts., Connemara, Galway.

24. **L. Gagei** A. L. Sm.—Thallus effuse, thickish, smooth, rimulose, cream-coloured or brownish-white (K + yellow, CaCl —). Apothecia minute or moderate, at first immersed, plane, with thin entire margin, at length superficial, somewhat convex and immarginate, brownish-red; paraphyses slender, not well discrete, brownish at the apices; hypothecium yellowish; spores ellipsoid, 18–22 μ long, 8–10 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*L. Taylori* Mudd Man. 199 (1861); Leight. Lich. Fl. 291; ed. 3, 296. *L. lævigata* Nyl. in Cromb. Lich. Brit. 65 (1870). *Lichen Gagei* Sm. Engl. Bot. t. 2580 (1814), young state. *Verrucaria Gagei* Borr. ex Hook. in Sm. Engl. Flora v. 153 (1833). *Baomyces anomalus* Tayl. in Mackay Fl. Hib. ii. 79 (1836). *Biatora Taylori* Salw. in Trans. Penzance Nat. Hist. Soc. 1853, 144.

Exsicc. Leight. n. 283 (as *Baomyces anomalus*).

A distinct species with much of the general aspect of *L. phaeops*, but with different apothecia. It also somewhat resembles states of *L. coarctata*, but the smoother, thicker thallus and the firmer immarginate apothecia keep it distinct. These latter, numerous though scattered, are at length somewhat difform, and in more shady situations they remain immersed.

Hab. On rocks, granitic and schistose, in maritime and mountainous districts.—*Distr.* Only a few localities in W. England and W. Ireland, but plentiful where it occurs.—*B. M.* Bolt Head and near Torquay, Devon; near Penzance, Cornwall; Cader Idris and Barmouth, Merioneth; Bathampton Downs, Somerset; Craigforda, Shropshire; Glens, Killybegney, Dunkerron and Blackwater Bridge, Kerry; Lough Inagh and Doughruagh Mt., Connemara, Galway.

25. **L. coarctata** Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 358 (1856).—Thallus effuse, thinnish, rimulose, subareolate or continuous, whitish or greyish (Kf + yellowish, CaCl + deep-red). Apothecia small, innate-sessile, plane or convex, light brown then reddish-brown or blackish, generally with an irregular spurious white epithalline margin which is sometimes connivent and almost closed over the apothecium, or disappearing; hypothecium almost colourless; paraphyses slender, dark at the apices; spores ellipsoid, large, 14–26 μ long, 7–12 μ thick; hymenial gelatine pale-bluish then wine-red with iodine.—Cromb. Lich. Brit. 66 & in Grevillea xxii. 9; Leight. Lich. Fl. 278; ed. 3, 280. *Lichen*

coarctatus Sm. Engl. Bot. t. 534 (1799). *Rinodina coarctata* S. F. Gray Nat. Arr. i. 449 (1821). *Lecanora coarctata* Hook. in Sm. Engl. Fl. v. 187 (1833); Tayl. in Mackay Fl. Hib. ii. 134; Mudd Man. 154.

Exsicc. Leight. n. 177; Johns. n. 332.

Viewed by many authors as a *Lecanora* from the spurious thalloid margin of the apothecia, which, however, contains no algal cells. Nylander has also referred it to that genus (Enum. Lich. Fret. Behr. 12), where its place would be in the *Aspicilia* section. It is a very protean species, both as to the thallus and the apothecia, the differences in which give rise to the varieties and forms that follow. In the typical specimen figured in Engl. Bot. the thallus is thin, rimose-areolate, rugulose, in which state it seems to be *Lecanora ocrinata* Ach. Lich. Univ. 380 & Syn. 102. The apothecia are numerous, usually more or less scattered, becoming in age convex, blackish, with the spurious margin obliterated. The contents of the spore when young are pale rose-coloured with large oil-globules.

Hab. On walls and rocks, chiefly brick and sandstone, in maritime and upland districts.—*Distr.* Only here and there in England and Wales; not seen from Scotland or Ireland.—*B. M.* St. Minver and near Cambourne, Cornwall; Swanage, Dorset; Fairlight, Hastings, and Ardingly, Sussex; Tunbridge Wells and Broadwater Forest, Kent; Reigate and Leith Hill, Surrey; Hendon, Middlesex; Dolgelly and Cader Idris, Merioneth; Abdon, Shropshire; Yarmouth, Norfolk; Harris Moor and Barrowmouth, Whitehaven, Cumberland.

Var. *elacista* Cromb. Lich. Brit. 66 (1870).—Thallus effuse, thin or very thin, subleprose or rimulose, contiguous or somewhat scattered, whitish or greyish-white, often subobsolete. Apothecia minute or subminute, concave or plain, the epithalline margin pulverulent, at length naked, evanescent; otherwise nearly as in the species.—*L. coarctata* form *elacista* Leight. Lich. Fl. 278 pro parte (1871); ed. 3, 281 pro parte. *Parmelia elacista* Ach. Meth. 159, t. iv. f. 4 (1803). *Lecanora coarctata* var. *elacista* Mudd Man. 154 pro parte (1861).

Exsicc. Johns. n. 333; Larb. Lich. Hb. nos. 41, 342; Mudd n. 124.

Differs in the thinner, often subpulverulent thallus and the smaller apothecia, which are often blackish and immarginate in age. In both respects, however, it presents diversities resulting chiefly from the nature of the habitat. Thus when pulverulent the thallus is frequently little visible, when it is form *cotaria* Cromb. in Grevillea xxii. 9 (*Lecidea cotaria* Ach. Meth. Suppl. 11 (1803)); occasionally it is entirely absent, when it is form *depauperata* Leight. Lich. Fl. ed. 3, 282 (1879). The apothecia in a very young state are subglobose, with the pseudo-thalline margin connivent, and concealing the epithecium: it is then form *variolora* Leight. Lich. Fl. ed. 3, 282 (Flot. Lich. Siles. 120), having, as Acharius says (*l. c.*), the aspect of *Verrucaria leucocephala* (see *Lecanactis abietina*). Very rarely this margin is persistent and more or less crenulate.

Hab. On rocks, walls, and stones in maritime and mountainous districts.—*Distr.* Not uncommon in most parts of Great Britain and

probably also of Ireland; not found with certainty in the Channel Islands.—*B. M.* Leith Hill, Surrey; Springfield near Chelmsford, and Galleywood Common, Essex; St. Leonards and Fairlight Glen, near Hastings, Sussex; Luccomb and near Shanklin, Isle of Wight; Launceston, Withiel and Newlyn Cliff, Cornwall; Axe Edge, Buxton, Derbyshire; Ledbury, Herefordshire; Malvern, Worcestershire; Charnwood, Leicestershire; Caradoc, Shropshire; Dolgelly and Cader Idris, Merioneth; near Ayton, Cleveland, Yorkshire; Egglesstone, Durham; Barrowmouth, Whitehaven, Cumberland; Annan, Dumfriesshire; I. of Arran; Achosragan Hill, Appin, Argyll; Ben Lawers and Craig Tulloch, Perthshire; near Portlethen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire; Bantry and Kileully, Cork; Kylemore and Doughruagh Mt., Connemara, Galway.

Var. *glebulosa* Cromb. Lich. Brit. 66 (1870) & in *Grevillea* xxii. 9.—Thallus determinate or subdeterminate, thickish, verrucose-glebulose or subsquamulose, the squamules tumid, somewhat scattered or crowded, minutely lobed at the circumference, whitish or glaucous-white. Apothecia small, plane or slightly convex, reddish-brown, becoming dark-red, the margin thin, speedily evanescent; otherwise as in the species.—*L. coarctata* f. *glebulosa*, f. *involuta* and f. *ornata* Leight. Lich. Fl. 279 (1871); ed. 3, 281. *Lichen glebulosus* Sm. Engl. Bot. t. 1955 (1809). *Lepidoma glebulosum* S. F. Gray Nat. Arr. i. 462 (1821). *Lecanora coarctata* var. β *ornata* Sommerf. Suppl. Fl. Lapp. 92 (1826); Mudd Man. 154 pro parte. *L. coarctata* var. β *glebulosa* Mudd and var. γ *involuta* Mudd Man. 154 (1861). *L. involuta* Tayl. in Mackay Fl. Hib. ii. 134 (1836). *Psora glebulosa* Hook. in Sm. Engl. Fl. v. 193 (1833).

Exsicc. Leight. n. 149; Mudd n. 123; Larb. Lich. Hb. n. 170; Johns. nos. 334, 425.

Perhaps a subspecies, looking when best developed as if it were even a distinct species. It is then well marked, as stated by Sommerfelt, *l. c.*, by the areolate crust being subeffigurate at the margins; in some specimens, however, to which are referable the British exsiccata, this character is not so apparent. The thallus occasionally occurs in small orbicular, scattered patches, when it is form *microphyllina* Cromb. in *Grevillea l. c.* (Fr. Lich. Europ. 105, sub *Parmelia*); it then somewhat resembles form *dispersa* of *Lecanora gelida* (*vide* Monogr. i. 262).

Hab. On rocks and walls, rarely on the ground, in maritime and upland situations.—*Distr.* Only here and there in England, more frequently on the Grampians, Scotland; seen from only a few localities in Ireland.—*B. M.* Henfield and Patcham Sussex; near Redruth, Cornwall; Malvern Hills, Worcestershire; Cader Idris, Merioneth; Glyder Vawr, Caernarthen; Oswestry and Haughmond Hill, Shropshire; Ayton Moor, Guisboro' Moor and Cockshaw Bank, Cleveland, Yorkshire; Knitsby, Durham; Kilhope Law and Egremont, Cumberland; Springfield, Dumfriesshire; King's Park, Stirling; Achosragan Hill, Appin and Ben Cruachan, Argyll; Ben Lawers, Kinnoul Hill, Trossachs, and Craig Tulloch, Perthshire; Countesswells Wood, near Aberdeen; Glen Nevis, Invernessshire; Dunkerron, Kerry; Ross, Clare; Kylemore and near Glendalough, Galway.

26. *L. prærimata* Nyl. in Flora lix. 235 (1876).—Thallus effuse, continuous, thinnish, rimose, the rimæ subareolate or subparallel-radiant, white or whitish, sprinkled with concolorous convex often confluent soredia (K —, CaCl + red). Apothecia superficial, small, convex, brown, the epithalline margin evanescent; spores not rightly developed.—Cromb. in Grevillea v. 26 (1876); Leight. Lich. Fl. ed. 3, 282.

Perhaps, as Nylander says (*l. c.*), only a subspecies of *L. coarctata*, differing in the character of the thallus, more especially the presence of soredia. In the single British specimen seen there are only in two instances very faint traces of an epithalline margin to the apothecia, while the spores are immature and scarcely visible.

Hab. On granitic rocks in a maritime district.—*B. M.* Jersey (the only locality).

27. *L. Brujeriana* Nyl. in Mém. Soc. Sci. Nat. Cherbourg, v. 122 (1857).—Thallus effuse, thinnish, verrucose-glebulose, pale- or sordid-yellow (K —, K(CaCl) + yellow), at times subevanescent. Apothecia sessile, somewhat large, concave, brownish-black or black (epithecium K(CaCl) + reddish), the margin thickish, repand and involute; hypothecium sordid-brownish; paraphyses slender, brown at tips, discrete; spores ovoid or ellipsoid, large, 18–21 μ long, 8–11 μ thick; hymenial gelatine tawny-yellow with iodine.—Cromb. Lich. Brit. 66 (1870); Leight. Lich. Fl. 281; ed. 3, 285. *Parmelia coarctata* var. β *Brujeriana* Schær. Lich. Helv. Exs. n. 539 (1847). *Lecanora coarctata* var. *Brujeriana* Schær. Enum. 77 (1850).

Ersicc. Leight. n. 390.

Well characterized by the pezizoid apothecia, which easily distinguish it from *L. coarctata*, to which it is closely allied. The thallus is at times somewhat ochraceous, whence form *ochroides* Nyl. ex Stirton in Grevillea ii. 71 (1873), a state to which two of the British specimens are referable. The spores are often almost uniseriate in the narrow elongate asci.

Hab. On schistose rocks in mountainous regions.—*Distr.* Very local in N. Wales, N. England, and the S. and N. Grampians, Scotland.—*B. M.* Cader Idris, Aberdovey and Dolgelly, Merioneth; Force Garth, Teesdale, Durham; Ben Lawers and Kinloch Rannoch, Perthshire.

28. *L. arridens* Nyl. in Flora lix. 573 (1876).—Thallus somewhat scattered, very thin, plane, cracked, white or whitish (K —, CaCl —), often evanescent. Apothecia small, somewhat plane, immarginate, irregular, bright rose-flesh-coloured, concolorous within, usually with an irregular spurious white epithalline margin; paraphyses slender, not crowded; perithecium with the epithecium and hypothecium colourless; spores ellipsoid, 14–18 μ long, 7–10 μ thick; hymenial gelatine tawny-wine-red with iodine.—Cromb. in Grevillea v. 106; Leight. Lich. Fl. ed. 3, 308.

Has a slight resemblance to early states of *L. coarctata* in the rose-colour internally, but differs in the absence of any thalline reactions,

in the colour (persistent) of the apothecia and of the epithecium, and in the shorter spores. In one of the two specimens seen the thallus is determinate and small, with the apothecia sparingly present; and in the other it is diffuse and scarcely visible, with the apothecia more frequent.

Hab. On decomposed quartzose rocks in a mountainous district.—*B. M.* Delphi, Connemara, Galway (recorded also from Howth, near Dublin).

29. *L. granulosa* Ach. Meth. 65 (1803).—Thallus effuse, thinnish, granulose or leprose, whitish or glaucous-grey (K + yellowish, CaCl + reddish). Apothecia moderate in size, appressed, plane or convex, variable in colour, brick-red, pale- or livid-brown, or blackish, the margin thin, entire or flexuose, pale, at length obliterated; hypothecium colourless or pale-greenish-yellow; paraphyses coherent, thickish and brownish at the apices; spores oblong-ellipsoid, 9–16 μ long, 4–7 μ thick; hymenial gelatine slightly bluish then reddish or sordid-violet with iodine.—*L. decolorans* Floerke in Berl. Mag. iii. 193 (1809); S. F. Gray Nat. Arr. i. 470 (1821); Mudd Man. 197; Cromb. Lich. Brit. 66; Leight. Lich. Fl. 261; ed. 3, 258; Hook. Fl. Scot. ii. 29 (incl. var. *granulosa*); *L. quadricolor* Hook. in Sm. Engl. Fl. v. 182 (1833); Tayl. in Mackay Fl. Hib. ii. 128. *Lichen granuloseus* Ehrh. Crypt. Exs. n. 145 (1785). *L. quadricolor* Dicks. Crypt. fasc. iii. 15, t. ix. f. 3 (1793); Engl. Bot. t. 1185; With. Arr. ed. 3, iv. 24 (1796). *Verrucaria granulosa* Hoffm. Pl. Lich. ii. 21, t. 30, f. 3 (1794) & Deutschl. Fl. ii. 177 (1795).

Exsicc. Leight. nos. 59, 352; Mudd n. 165; Larb. Lich. Hb. n. 140.

Well characterized by the variously coloured apothecia, the different tints being apparently due to age; these, however, are not always present in the same specimen, some plants being merely unicolorous. On bare moorlands it often spreads extensively, and when sterile and associated with species of *Cladonia* might be taken for their basal crust. When lignicolous the thallus is thinner and usually more pulverulent. The not unfrequent spermogones have the sterigmata simple, short, with straight spermatia 5–6 μ long, scarcely 1 μ thick. Crombie (*Grevillea* vii. 142 (1879)) has suggested that *Lecanora farinaria* Borr. Engl. Bot. Suppl. t. 2727 (1832) is synonymous with this species, but an examination of the specimens quoted scarcely bears out his statement.

Hab. On peaty ground, not unfrequently on stumps of dead fir, rarely incrusting mosses, from upland to alpine situations.—*Distr.* General and common in Great Britain, no doubt also in Ireland, very abundant on the Grampians; not seen from the Channel Islands.—*B. M.* Epping Forest, Essex; Ightham, Kent; New Forest, Hants; Dartmoor, Devon; North Wootton Common, Norfolk; near Buxton, Derbyshire; Lickey Hills, Worcestershire; Cader Idris, Merioneth; Long Mynd, Aroll Hill, and Stiperstones Hill, Shropshire; Parkgate, Cheshire; Guisboro' Moor and Ayton Moor, Cleveland, Yorkshire; Egglestone, Durham; near Hexham, Northumberland; Pentland Hills, near Edinburgh; Achosragan Hill, Appin, Argyll; Cockhill, Callander,

Craig Calliach, Ben Lawers and Rannoch, Perthshire; Clova, Forfarshire; Countesswells Wood, near Aberdeen; Glen Dee and Ben-naboord, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Lairg, Sutherland; The Storr, Island of Skye; Applecross, Rossshire; near Belfast, Antrim; Doneraile Mts., Cork; Killarney, Kerry; Delphi, Connemara, Galway.

Form 1. *saxatilis* Larb. in Leight. Lich. Flora, ed. 3, 259 (1879) (nomen).—Thallus very thin, the granules scattered, subevanescent. Apothecia subminute, livid-brown; otherwise as in the species.

Exsicc. Larb. Lich. Hb. n. 101.

Evidently only a depauperate state of the species, resulting from the nature of the substratum on which it is erratic. In the specimen seen the apothecia are either solitary or here and there confluent.

Hab. On moist rocks in an upland district.—*B. M.* By Lough Muck, Connemara, Galway (the only locality).

Form 2. *viridula* A. L. Sm.—Thallus granulose-leprose, greyish-green, the granules at length deliquescent, pulverulent, yellowish. Apothecia somewhat small, blackish, solitary or confluent; otherwise as in the species.—*L. decolorans* var. γ *viridula* Mudd Man. 197 (1861); form *aporetica* (vix Koerb. non Ach.) Leight. Lich. Fl. ed. 3, 259 (1879).

Exsicc. Mudd n. 166.

Differs merely in the colour of the more leprose thallus, which is dark-green when moist. It is apparently only one of the numerous conditions of this polymorphous plant, affected by atmospheric influences.

Hab. On peaty ground in upland tracts.—*B. M.* Cliffrigg, Cleveland, Yorkshire (f. *viridula*); Craig Calliach, Perthshire (f. *aporetica*).

Var. *escharoides* Schær. Enum. 137 (1850).—Thallus granulose-verrucose, greyish-white. Apothecia convex, subimmarginate, more or less confluent, brownish-black or black.—*L. decolorans* var. β *escharoides* Mudd Man. 197; form *escharoides* Leight. Lich. Fl. ed. 3, 258. *Lichen escharoides* Ehrh. Crypt. Exs. n. 313 (1793). *Lecidea decolorans* var. *desertorum* (Ach.?) Cromb. in Grevillea xxii. 9 (1893).

Differs in the thicker more developed thallus and the constantly darker apothecia, which are usually several confluent and irregular.

Hab. On peaty soil in mountainous regions.—*Distr.* Seen only from N. England and the Grampians, Scotland.—*B. M.* Ayton Moor, Cleveland, Yorkshire; Egglestone, Durham; Ben Lawers and Rannoch Moor, Perthshire; Ben Avon and Cairngorm, Braemar, Aberdeenshire.

30. *L. flexuosa* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 121 (1857).—Thallus effuse, thin, granulose, greenish or greyish-green (Kf + yellow, CaCl + reddish), at times subevanescent. Apothecia small, sessile, plane, black or blackish, the margin thin, paler, often flexuose; hypothecium colourless; paraphyses brownish at

the apices; spores ellipsoid, minute, 7-9 μ long, 3.5-4.5 μ thick; hymenial gelatine pale-bluish then tawny-reddish with iodine.—Mudd Man. 196; Leight. Lich. Fl. 260; ed. 3, 256. *L. decolorans* subsp. *flexuosa* Cromb. Lich. Brit. 66 (1870). *Biatora flexuosa* Fr. in Vet. Ak. Handl. 1822, 268 (nomen) & Sched. Crit. viii. 11 (1826).

Exsicc. Cromb. n. 80; Larb. Lich. Hb. n. 341.

The thallus in some of the specimens resembles that of *Lecanora conizaea*, with which it might be confused in a sterile condition. It differs from the preceding species in the more finely granulose crust, in the constantly darker apothecia and in the much smaller spores. British specimens seen are well fertile.

Hab. On old pales and stumps of trees, chiefly larch, in upland wooded districts.—*Distr.* Rather local, though plentiful where it occurs, in Great Britain; not seen from Ireland.—*B. M.* Near Ullacombe, Bovey Tracey, Devon; Bardon Hill, Leicestershire; Haughmond Hill, Shropshire, near Llanwrtyd; Lounsdale, Cleveland, Yorkshire; Teesdale, Durham; Staveley, Westmorland; Glen Falloch, Graig Calliach, and Achmore, Killin, Perthshire; Countesswells Woods, near Aberdeen.

Form *æruginosa* Leight. Lich. Fl. 260 (1871); ed. 3, 256.—Thallus leprose-pulverulent, dark verdigris-green; otherwise as in the species.—*Lecidea aruginosa* Borr. in Engl. Bot. Suppl. t. 2682 (1831); Hook. in Sm. Engl. Fl. v. 181. *L. flexuosa* var. β *aruginosa* Mudd Man. 197 (1861).

Exsicc. Leight. n. 406; Larb. Lich. Hb. nos. 65, 66; Johns. n. 442.

Differs merely in the darker thalline granules becoming dissolved into an æruginose powder. It often occurs sterile and might then be taken for the *Lepraria* form of some other species.

Hab. On old pales and on the bark of old trees in upland wooded situations.—*Distr.* Not uncommon throughout England; rare in S. Ireland; not seen from Scotland.—*B. M.* Highbeech, Epping Forest, and Chelmsford, Essex; near Mill Hill, Middlesex; Leith Hill, Surrey; Bolney, Ardingly, Cuckfield and Henfield, Sussex; Lyndhurst, New Forest, Hants; Ullacombe, near Bovey Tracey, Devon; near Virginia Water, Berks; Harboro' Magna, Warwickshire; Babraham Park, Cambridgeshire; North Wootton, Norfolk; Goyt Bridge, near Buxton, Derbyshire; Twycross, Leicestershire; Battenhall, Worcestershire; Morda, Oswestry, Shropshire; Baysdale, Cleveland, Yorkshire; Staveley, Westmorland; Whitehaven, Cumberland.

31. *L. viridescens* Ach. Meth. 62 (1803).—Thallus effuse, thin, minutely granulose-leprose, pale-greenish (Kf + yellowish, K(CaCl) + crimson). Apothecia minute, almost sessile, sub-convex, subimmarginate, opaque, brownish- or dull-black, within dark or whitish; hypothecium and hymenium, pale or yellowish; paraphyses slender, subconcrete, brown at the apices; spores ellipsoid, 10-13 μ long, 4-6 μ thick; hymenial gelatine bluish with iodine.—Mudd Man. 196; Cromb. Lich. Brit. 67; Leight. Lich. Fl. 264; ed. 3, 262. *Lichen viridescens* Schrad. Spicil. 88 (1794).

Exsicc. Mudd n. 164 (as *L. prasina*); Cromb. n. 81 (as *L. granulosa* var. *aporetica*).

Might at first sight be taken for a lignicolous form of *L. granulosa*, from which the smaller, constantly darker apothecia, the smaller spores, &c., distinguish it. The apothecia are sometimes solitary or more frequently crowded and confluent.

Hab. On decayed trunks of trees in upland and maritime wooded districts.—*Distr.* Only a very few localities in England and the S.W. Highlands of Scotland.—*B. M.* New Forest, Hants; Hurstpierpoint, Sussex; Oaksey, Wiltshire; Oswestry, Shropshire; Hoggart's Wood, Ingleby, Yorkshire; Levens Park, Westmorland; Barcaldine, Argyll.

32. *L. gelatinosa* Floerke in Berl. Mag. 1809, 201.—Thallus effuse, thin, leprose-gelatinous, greenish-grey or subæruginescent (K —, CaCl —), at times nearly evanescent. Apothecia submoderate in size, appressed, plane, blackish or livid, with thin, paler margin, at length immarginate, pale-brownish within; hypothecium colourless or pale-yellowish-brown; paraphyses slender, coherent, olive or brownish at the apices; spores ellipsoid or oblong-ellipsoid, 7–9 μ long, 4–5 μ thick; hymenial gelatine slightly bluish then tawny-wine-reddish with iodine.—Cromb. Lich. Brit. 67; Leight. Lich. Fl. 299; ed. 3, 308. *L. viridescens* var. β *gelatinosa* Mudd Man. 196 (1861). *Biatora viridescens* var. α *gelatinosa* Koerb. Syst. Lich. Germ. 201 (1855).

Exsicc. Leight. n. 353; Larb. Lich. Hb. n. 30.

Differs from the preceding, of which it has frequently been regarded as a variety, in the thinner subgelatinous thallus, the plane apothecia and the smaller spores. The apothecia, though numerous, are somewhat scattered, becoming at length difform.

Hab. On the bare ground, rarely incrusting decaying mosses, in upland situations.—*Distr.* Very few localities in Great Britain and Ireland.—*B. M.* The Downs, Sussex; Withiel, Cornwall; Stiperstones Hill and the Wrekin, Shropshire; Guisboro' Moor and near Ayton, Cleveland, Yorkshire; Glen Falloch and Aberfeldy, Perthshire; Barcaldine, Argyll; near Bantry, Cork; Lough Muck, Connemara, Galway.

Subsp. *prasinatorufa* Nyl. in Flora lxx. 453 (1882).—Thallus sorediose, the soredia rotundate, somewhat plane, greenish or yellowish. Apothecia small, immarginate, dark-red, pale within; hypothecium colourless; spores ellipsoid, 9–10 μ long, 4 μ thick.

Differs from the species chiefly in the presence of soredia and the colour of the fructification. In the British specimens the apothecia are sparingly present. The sterile plant is probably not uncommon in the Highlands of Scotland, where the soredia are either yellowish or subæruginescent.

Hab. On turf ground in an upland hilly district.—*B. M.* Dartmoor, Devon (the only locality).

33. *L. uliginosa* Ach. Meth. 43 (1803) (excl. var. *geomæa*) & in Vet. Ak. Handl. 262 (1808).—Thallus effuse, thinnish, minutely granulose, subleprose, brownish or brownish-black (K —, CaCl —);

hypothallus blackish. Apothecia minute, plane or somewhat convex, brownish-black or blackish, within blackish (slightly greyish in the middle), the margin thin, paler, evanescent; paraphyses indistinct, brown at the apices; hypothecium brown; spores ellipsoid, up to 8-10 μ long, 4-10 μ thick; hymenial gelatine bluish or greenish then tawny-wine-coloured with iodine. —S. F. Gray Nat. Arr. i. 467; Hook. in Sm. Engl. Fl. v. 179; Tayl. in Mackay Fl. Hib. ii. 124; Mudd Man. 197 pro parte; Cromb. Lich. Brit. 67 pro parte and in Grevillea xxii. 9; Leight. Lich. Fl. 274 pro parte; ed. 3, 274 pro parte. *Lichen uliginosus* Schrad. Spicil. 88 (1794); Engl. Bot. t. 1466.

Exsicc. Leight. nos. 120, 354; Mudd n. 167; Cromb. n. 82; Larb. Lich. Hb. n. 225; Johns. n. 372 and 426 (as *L. fusca* Schær).

Often spreads very extensively on moors, like *L. granulosa*, but with a darker thallus which in dry weather is scarcely distinguishable from the substratum. In moist shady situations the thallus is at times greenish and subgelatinose with paler apothecia; these are numerous, often crowded and confluent, becoming in age convex and here and there several aggregate.

Hab. On turf, rarely sandy soil and mossy stumps of trees, chiefly firs, in upland and subalpine localities.—*Distr.* General and common in most parts of Great Britain and no doubt also of Ireland (*vide* Tayl. l. c.) though seen from only a few localities.—*B. M.* Epping Forest and Galleywood Common, near Chelmsford, Essex; Reigate Hill, Surrey; near Lyndhurst, New Forest, Hants; Dartmoor, Devonshire; Roughton, Cornwall; Broadwater and Tilgate, Sussex; North Wootton Common, Norfolk; Goyt Lane, Buxton, Derbyshire; Malvern Hills, Worcestershire; Dolgelly and Cader Idris, Merioneth; Wrekin Hill, Shropshire; Haugmond Hill and Gruis Hill, Shropshire; Bowdon Heath, Cheshire; Kildale Moor, Cleveland, Yorkshire; Teesdale, Durham; Windermere, Westmorland; Dent Hill, Cumberland; The Cheviots, Northumberland; Pentland Hills, near Edinburgh; Appin, Argyll; Craig Calliach, Ben Lawers and Rannoch Moor, Perthshire; Hill of Ardo and Morrone, Braemar, Aberdeenshire; Ben Nevis, Invernessshire; near Lairg, Sutherlandshire; Hills of Applecross, Rosshire; Cork.

Var. humosa Ach. Meth. 43 (1803).—Thallus very thin, leprose-granulose, the granules somewhat scattered, brownish-black. Apothecia subminute, at length convex, brownish-black or black; otherwise as in the species.—Cromb. Lich. Brit. 67; Leight. Lich. Fl. 275; ed. 3, 275 pro minima parte. *L. humosa* Leight. Lich. Fl. ed. 3, 277 (1879). *Lichen humosus* Ehrh. Pl. Crypt. Exs. n. 135 (1789) pro parte.

Exsicc. Larb. Lich. Hb. nos. 265, 308.

Differs in the colour of the thallus, which is at times almost evanescent, and in the darker more constantly convex apothecia, which are at length crowded and aggregate. In shady situations, when saxicolous, the thallus is more or less greenish. Intermediate between the species and *L. fuliginea*.

Hab. On the ground and on turf walls, rarely on shady rocks, in maritime and upland districts.—*Distr.* Here and there in Great

Britain; rare in the Channel Islands, and in N.W. Ireland; no doubt often overlooked.—*B. M.* Near the Coupée, Island of Sark; New Forest and near Bournemouth, Hants; Leith Hill, Surrey; Dolgelly and Cader Idris, Merioneth; North Wootton, Norfolk; Ben Lawers and Rannoch, Perthshire; Lough Inagh, Connemara, Galway (saxicolous).

34. *L. fuliginea* Ach. Syn. 35 (1814); Nyl. in Flora lxii. 206 (1879).—Thallus effuse, minutely granulose, brownish black or fuliginous, the granules globose, crowded, subscabrid (K —, CaCl —). Apothecia small, plane, marginate, the margin thin, entire, at length convex and immarginate, reddish or dark-brown; paraphyses indistinct, brownish; hymenium and hypothecium yellowish-brown; spores ellipsoid, 8–15 μ long, 4–7 μ thick; hymenial gelatine faintly bluish then tawny-wine-coloured with iodine.—Cromb. in Grevillea xxii. 9. *L. uliginosa* var. β *fuliginea* Mudd Man. 198 (1861); form *fuliginea* Leight. Lich. Fl. 274 (1871); ed. 3, 274.

Exsicc. Larb. Lich. Hb. n. 226.

Usually regarded as being only a lignicolous condition of a form of the preceding species, to which it is intimately related. It is, however, distinct in the generally smaller spores. The subgelatinous nature of the thallus, pointed out by Acharius, with the ready absorption of water, seems to be due to the presence of gelatinous blue-green algæ on the substratum, which itself imbibes and holds moisture. In more shady and damp situations the plant is always sterile.

Hab. On old palings and dead wood in upland situations.—*Distr.* Here and there throughout Great Britain, and plentiful where it occurs; very rare in the Channel Islands; not seen from Ireland.—*B. M.* Island of Sark; Tuddenham, Suffolk; Epping Forest and Langford, Essex; Westwood Common, Surrey; near Penshurst, Kent; New Forest, Hants; Dartmoor, Devon; Finchley and Millhill, Middlesex; Pondlye and Enningham, Sussex; Elstree, Herts; Gopsall Park, Leicestershire; Ombersley, near Worcester; Baysdale, Yorkshire; Appin, Argyll; Glen Falloch, Graig Calliach, and Ben Lawers, Perthshire; Countesswells Woods, near Aberdeen; Lairg, Sutherland.

35. *L. perobscura* Nyl. in Flora lvii. 9 (1874).—Thallus effuse, thin, subopaque, black, brownish-black when moist (K —, CaCl —). Apothecia small, more or less scattered, somewhat convex, immarginate, brown then black, greyish within; paraphyses coherent; epithecium brownish, almost black in thick section; hypothecium colourless; spores ellipsoid, small, 6–8 μ long, about 3.5 μ thick; hymenial gelatine bluish with iodine.—Cromb. in Grevillea ii. 140; Leight. Lich. Fl. ed. 3, 308.

The thallus is at times very thin, becoming nearly evanescent. It is allied to *L. fuliginea*, but differs in the colour of the apothecia internally, in that of the hypothecium and in the much smaller spores.

Hab. On old fir palings in wooded upland districts.—*B. M.* Near Killin and Killiecrankie, Perthshire.

36. *L. epimarta* Nyl. in Flora lx. 226 (1877).—Thallus effuse, minutely depressed-granulate, the granules small, rounded or

flattened, scattered, whitish (K + yellow, CaCl —). Apothecia small, somewhat obconical, plane above, narrowed below, immarginate, brown, usually rusty-ochraceous-suffused, internally pale-dusky-ochraceous; hymenium somewhat ochraceous; paraphyses slender, scanty; hypothecium thick, solid, nearly colourless or faintly ochraceous; spores oblong, minute, 6–9 μ long, 3–4 μ thick; hymenial gelatine bluish then (especially the asci) tawny-yellow with iodine.—Cromb. in Grevillea vi. 18; Leight. Lich. Fl. ed. 3, 266.

A small and singular species, readily distinguished from its more immediate allies by the form and colour of the apothecia which are somewhat crowded and prominent, or becoming plane. Nylander has observed that the epithelial granulations on the application of K are changed into raphides, a peculiar character of the plant that I have been unable to verify. The single specimen collected was associated with *Cladonia (Pycnothelia) papillaria*.

Hab. On peaty soil in a subalpine district.—B. M. Achosragan Hill, Appin, Argyll (the only locality).

37. *L. æstivalis* Ohl. in Schrift. Phys. Ök. Ges. Königsb. xi. 16 (1870).—Thallus effuse, thin, granulose, yellowish-green, often evanescent. Apothecia small, convex, immarginate, brownish, greyish-pruinose; paraphyses indistinct; hypothecium colourless; spores fusiform-oblong, 15–16 μ long, 5–6 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Cromb. in Journ. Bot. xiv. 361 (1876); Leight. Lich. Fl. ed. 3, 260.

Resembling in appearance *Bilimbia metamorphea*, of which it may perhaps be only a variety (see Ohlert, l. c.). It differs in the firmer apothecia and the smaller and apparently constantly simple spores.

Hab. Incrusting mosses on walls in a maritime district.—B. M. Killery Bay, Connemara, Galway.

38. *L. vernalis* Ach. Meth. 68 (1803) & in Vet. Akad. Handl. 1808, 266.—Thallus effuse, thin, unequal or subgranulose-unequal, whitish or greyish-white (K —, CaCl —), at times almost obsolete. Apothecia rather small, adnate, convex, shining, immarginate, red or pale-reddish, paraphyses yellowish, indistinct; hypothecium yellowish-brown; spores oblong or ellipsoid-oblong, 11–23 μ long, 4–7 μ thick; hymenial gelatine slightly bluish then wine-red with iodine.—S. F. Gray Nat. Arr. i. 470; Carroll in Journ. Bot. iii. 290 (1865); Cromb. Lich. Brit. 68 pro parte; Leight. Lich. Fl. 262 pro parte; ed. 3, 259 pro parte; Cromb. in Grevillea xxii. 10. *Lichen vernalis* Linn. Syst. Nat. iii. 234 (1768).

Regarded by Nylander as the typical species of this section. By earlier authors it was confused with other lichens, especially *Bacidia luteola* and *Biatorina pilularis*. As noted by Th. Fries (Lich. Scand. 429) the plant in Herb. Linnaeus is a slightly aberrant form of the present species. In its more typical condition it is one of the rare British lichens, though the subspecies that follows is rather more frequent. Our few specimens are well fertile, with the apothecia more or less crowded.

Hab. On decayed mosses upon the ground and on boulders in alpine situations.—*Distr.* Extremely local and scarce, having been gathered only very sparingly in N. England on two of the Grampians, and in the west of Scotland.—*B. M.* Mardale, Westmorland, near Killin; above Loch-na-Gat and near the summit of Ben Lawers, Perthshire; near the summit of Ben-naboord, Braemar, Aberdeenshire; near Aviemore, Invernesshire.

Subsp. *minor* Nyl. ex Norrl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. xiii. 335 (1873).—Thallus thin or very thin, smoothish or minutely granulose, whitish or pale-greenish. Apothecia subminute, pale brick-red to brown; spores ellipsoid-oblong, 10–20 μ long, 4–6 μ thick—*L. vernalis* f. *minor* Nyl. *op. cit.* v. 145 (1866); Cromb. Lich. Brit. 68; Leight. Lich. Fl. ed. 3, 259. *L. conglomerata* Mudd Man. 194 (1861); Leight. Lich. Fl. 260; ed. 3, 257. *L. subvernalis* Stirton in Grevillea iii. 33 (1874); Leight. Lich. Fl. ed. 3, 308. *Lichen conglomeratus* Heyder ex Hoffm. Deutschl. Fl. ii. 174 (1795).

Exsicc. Cromb. n. 172; Leight. n. 151; Mudd n. 162 (see Nyl. in Flora xlv. 78, as *L. vernalis* f. *corticalis*).

Distinguished from the species by the less developed thallus which at times is subevanescent, by the smaller apothecia and spores and by the different substratum. The apothecia are often several conglomerate, and may become dark-brown.

L. subvernalis as described by Stirton agrees in microscopic characters, but the apothecia, he states, from pale yellow become bluish or brownish-black. The specimen (from Grantown) has not been found in his herbarium.

Hab. On the bark of trees in upland wooded districts.—*Distr.* Seen from only a few localities in England and the S. Grampians, Scotland.—*B. M.* Oswestry, Shropshire; Bathford Hill, Somerset; Rodmarton, Gloucestershire; Yarmouth, Norfolk; Gopsall, Leicestershire; Broadwas, Worcestershire; Airyholme Wood and Cliffrig, Cleveland and Ingleby, Yorkshire; Finlarig, Killin, Perthshire; Airds, Appin, Argyll.

39. *L. meiocarpa* Nyl. in Flora lix. 577 (1876).—Thallus effuse, very thin, granulose-leprose, greyish or greenish-white, often subevanescent (K —, CaCl —). Apothecia minute, convex, immarginate, pale-yellow, yellow-testaceous or reddish; paraphyses colourless at the apices; hypothecium pale; spores oblong. 7–11 μ long, 3–4 μ thick; hymenial gelatine wine-red with iodine, —Cromb. in Grevillea xxii. 10. *L. anomala* var. γ *minuta* Schær. Spicil. 170 (1833) pro parte. *L. minuta* Cromb. Lich. Brit. 68 pro parte; Leight. Lich. Fl. 266; ed. 3, 264 pro parte. *L. effusa* Mudd Man. 195 (1861), (non Sm. Engl. Bot.).

A rather inconspicuous plant, resembling a diminutive state of *L. vernalis* subsp. *minor*, but differing in the smaller apothecia and spores. The apothecia are numerous, at times somewhat crowded, becoming reddish-black in age. *Lecidea minuta* var. *sarcopisioides*, considered as a variety of *L. meiocarpa* has been referred to *Lecanora sarcopisioides*. See Monogr. i. 295.

Hab. On trunks of trees; chiefly firs in maritime and upland wooded tracts.—*Distr.* Local and scarce in S. and N. England.—*B. M.* Specimen in Herb. Salwey n. 353, without locality; Cleveland, Yorkshire.

40. *L. albohyalina* Nyl. in Flora lix. 577 (1876).—Thallus effuse, very thin, leprose, sordid-whitish (K —, CaCl —), often obsolete. Apothecia minute, convex or subglobose, whitish or whitish-flesh-coloured becoming darker in age; hypothecium and paraphyses colourless; spores oblong or fusiform-oblong, simple or often 1-septate, 8–14 μ long, 2.5–3 μ thick; hymenial gelatine slightly bluish then tawny-wine-red with iodine.—*L. luteola* var. *albohyalina* Nyl. Herb. Mus. Fenn. 89 (1859). *L. anomala* var. *albohyalina* Nyl. Lich. Scand. 203 (1861).

Not unlike *L. meiocarpa*, with which it has been confused (Th. Fries Lich. Scand. 431); it differs, however, in the internal structure of the apothecium.

Hab. On smooth bark and decorticated trunks of trees in wooded upland tracts of mountainous districts.—*Distr.* Very local and scarce in N. Wales and the S. Grampians, Scotland.—*B. M.* Dolgelly, Merioneth; Craig Calliach, Perthshire.

41. *L. filamentosa* Stirton in Scott. Nat. v. 218 (1880).—Thallus whitish or pallid, rugulose or dispersed-areolate. Apothecia minute (2–4 mm. wide), brownish-black, plane, acutely marginate, becoming convex, the margin disappearing; hypothecium colourless; paraphyses slender, irregular, not well discrete, with dull-brownish apices; spores oblong or oblong-ellipsoid, 11–16 μ long, 5–6 μ thick; hymenial gelatine blue, then yellowish with iodine. Monogr. i. 469 (1918).

Hab. On fallen or worked wood.—*B. M.* Near Killin, Perthshire (the only locality).

42. *L. prasinolepis* Th. Fr. Lich. Scand. 417 (1874).—Thallus minutely squamulose-crustose, the squamules subimbricate, crenulate, greenish. Apothecia plane or slightly convex, submarginate, flesh-red or dull brick-red; paraphyses closely coherent; hypothecium colourless; spores ellipsoid, 10–15 μ long, 6–7 μ thick.—*Lecidea vernalis* subsp. *prasinolepis* Nyl. Lich. Scand. 202 (1861).

The specimen collected by Stirton at Kinloch Rannoch, on a tree-trunk (Sept. 1879) has a closely granulate thallus, only indistinctly squamulose. The apothecia are larger than in *L. vernalis*, generally about 1 mm. in diam. or less, plane or becoming slightly convex and flexuose or irregular in outline; the spores measure mostly 10 $\mu \times$ 4 μ .

Hab. On humous soil (or on trees) in hilly regions.—*B. M.* Kinloch Rannoch, Perthshire.

43. *L. humigena* Tayl. in Lond. Journ. Bot. vi. 150 (1847).—"Substratum of the thallus cuticular, gelatinous, whitish, with scattered minute roundish brown verrucæ; gemmæ (verrucæ?) granular, crowded, minute, oblong, subangular. Apothecia

greenish, hemispherical subpellucid, pale-brown, immarginate, the disc scabrous."—Monogr. i. 469 (1918). Specimen not seen.

Taylor states that the species cannot be confounded with *L. vernalis*. The description is too imperfect to permit a correct diagnosis.

Hab. On wet clay banks; Dunkerron, Kerry.

44. *L. tenebricosa* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 145 (1866).—Thallus effuse, very thin, unequal, greyish-white (K —, CaCl —), usually scarcely visible. Apothecia minute, plane or convex, brown or reddish-brown, the margin thin, darker, at length obliterated; paraphyses, subclavate, truncate and brown at the apices; hypothecium pale; spores oblong, 8–15 μ long, 4–5 μ thick; hymenial gelatine deep-blue then sordid with iodine.—Leight. Lich. Fl. ed. 3, 264; Cromb. in Grevillea xxii. 10. *L. anomala* var. *minuta* Schær. Spicil. 170 (1833) pro parte. *L. minuta* Massal. Ric. Lich. 76 (1852); Mudd Man. 195; Leight. Lich. Fl. 266 pro parte; ed. 3, 264 pro parte. *Lecanora anomala* var. ϵ *tenebricosa* Ach. Lich. Univ. 382 (1810) pro parte (*fide* Nyl. Lich. Scand. 201).

Exsicc. Leight. nos. 298, 326; Mudd n. 163.

Differs from *L. prasinolepis* in the constantly darker apothecia as well as in microscopic characters. The apothecia are usually somewhat scattered, and in more exposed situations become blackish.

Hab. On the trunks of trees, chiefly ash and poplars, in maritime and upland wooded districts.—*Distr.* Seen from only a very few localities in England, the S. W. Highlands of Scotland, and W. Ireland.—*B. M.* Lymington, Hants; Ullacombe, Bovey Tracey, S. Devon; Chalkney Woods, White Colne, Essex; Ledbury, Herefordshire; Cym Bychan, Merioneth; Airyholm Wood, Cleveland, Yorkshire; Glen Falloch and Finlarig, Killin, Perthshire; Mangerton, Kerry; Lough Inagh, Connemara, Galway.

45. *L. micrococcea* Cromb. in Journ. Bot. xiv. 361 (1876).—Thallus effuse, thin, leprose, dark- or bright-green (K —, CaCl —). Apothecia very minute, innate-sessile, subglobose, immarginate, yellowish to brick-red; paraphyses confluent; epithecium and hypothecium colourless; spores oblong or elongate; 9–12 μ long, 3–4 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Leight. Lich. Fl. ed. 3, 257. *Biatora micrococcea* Koerb. Par. Lich. 155 (1860).

Exsicc. Larb. Lich. Hb. n. 139.

Considered by Nylander to be closely related to *Biatorina prasina*, but is more nearly allied to *Lecidea quercea*, from which it differs in the narrower spores and in the absence of reactions with K or CaCl. It has been found recently by Watson in Somerset.

Hab. On decayed stumps and on bark of trees.—*Distr.* Rare in S.W. England and S.W. Ireland.—*B. M.* Castle Neroche, Taunton, Somerset; Lough Inagh, Connemara, Galway.

46. *L. grumosa* Leight. in Trans. Linn. Soc. ser. 2, i. 242, t. xxxiii. figs. 7 & 9 (1878).—Thallus evanescent. Apothecia

reddish-brown, minute, scattered, adnate, sessile, somewhat convex, the slight margin soon obliterated; hypothecium colourless; hymenium yellow, grumous; paraphyses indistinct, colourless; spores oblong, with granular contents, 13-15 μ long, 7-9 μ thick; hymenial gelatine blue then yellowish with iodine.—Leight. Lich. Fl. ed. 3, 309. Specimen not seen.

Hab. On pine bark, rare. Collected by Larbalestier at Ballinahinch, Galway.

47. **L. nigroclavata** Nyl. in Bot. Not. 160 (1853).—Thallus effuse, very thin, greyish-brown or evanescent (K —, CaCl —). Apothecia small, superficial, at first plane and thinly margined, at length convex and immarginate, becoming blackish-brown; hypothecium brownish or colourless; paraphyses stoutish, clavate-capitate, with a dark-brown line over the subglobose apex; spores oblong-cylindrical, 8-10 μ long, 2-4 μ thick; hymenial gelatine bluish with iodine.—*L. lenticularis* var. *nigroclavata* Nyl. Lich. Scand. 242, 1861; ed. 3, 336 (as form); subsp. *nigroclavata* Cromb. Lich. Brit. 91 (1870). *L. baliola* Nyl. in Flora lix. 308 (1876); Cromb. in Grevillea v. 27. *L. spodioplaça* Nyl. in Flora lx. 567 (1877); Cromb. op. cit. vi. 115; Leight. Lich. Fl. ed. 3, 307.

Exsicc. Larb. Lich. Hb. n. 228 (as *L. spodioplaça*).

Closely associated with *Biatorina lenticularis* in the form of the capitate paraphyses, differing only in the simple spores. *L. baliola* and *L. spodioplaça* are saxicolous forms; the former has the thallus tinged with peroxide of iron and has been found associated with *Lecanora lacustris*; the latter is greyish or sometimes greenish (f. *viridescens* Nyl. l. c.). On wood the thallus is hypophloeodal, the hyphæ and gonidia being situated beneath the wood-fibres.

Hab. On the trunks of old trees or on palings in S. England and S. Ireland; on moist maritime rocks in W. Ireland.—*B. M.* Lignicolous: Shanklin, I. of Wight; Lehenagh, near Cork; near Limerick, Clare. Saxicolous: Derrylare, Killery Bay and Kylemore Lake, Connemara, Galway.

48. **L. mucosa** Stirton in Scott. Nat. 1879, 17. —Thallus thin, scarcely visible, entangled in the wood-fibres, with a reddish-tawny gelatinous appearance due to the presence of blue-green algæ. Apothecia fuscous, sessile, plane, convex, or almost spherical, small; hypothecium fuscous; paraphyses confluent at the apices subclavate, colourless, but the epithecium brown in thick section; spores ellipsoid, 7-10 μ long, 4-5 μ thick; hymenial gelatine blue, then sordid with iodine.—Leight. Lich. Fl. ed. 3, 545; A. L. Sm. Monogr. ii. 103.

Hab. On decayed wood.—*B. M.* Opposite Ben Doran, near Tyndrum, Perthshire (the only locality).

49. **L. turgidula** Fr. Sched. Crit. i. 10 (1824).—Thallus effuse, very thin, granulose or pulverulent, whitish (K —, CaCl —),

often evanescent. Apothecia small, plane or convex, immarginate, black, brownish-black, or rarely reddish-brown, naked or slightly bluish-grey pruinose; paraphyses brownish or blackish at the apices; hypothecium pale-brownish or sordid-dark; spores ellipsoid or ellipsoid-oblong, minute, 7–12 μ long, 3–5 μ thick; hymenial gelatine deep blue then dark violet with iodine.—Mudd Man. 201; Cromb. Lich. Brit. 69; Leight. Lich. Fl. 263; ed. 3, 260.

Exsicc. Mudd n. 171; Cromb. n. 83.

A variable plant as to the thallus, the colours of the apothecia and the paraphyses. The thallus is usually more or less immersed (hypophloeodal) in lignicolous specimens, when the apothecia are erumpent between the fibres of the wood (form *erumpens* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iv. 232 (1859)). The apothecia are numerous and either solitary or congregate. The not unfrequent spermogones are black, with spermatia 5–6 μ long, about 1 μ thick.

Hab. On old pales, the bark and stumps of felled trees, chiefly fir, in upland wooded situations.—*Distr.* Occasionally throughout Great Britain, but plentiful where it occurs; not seen from Ireland.—*B. M.* Shanklin, Isle of Wight; Lyndhurst, New Forest, Hants; near Bovey Tracey, Devon; Cothelstone and Blackdowns, Somerset; North Spring, Westmorland; Rodmorton, Gloucestershire; Dolgelly, Merioneth; Bilsdale and Baysdale, Cleveland, Yorkshire; Aberfeldy, near Killin, Glen Fender, Ben Lawers, Glen Falloch and Black Wood of Rannoch, Perthshire; Countesswells Wood, near Aberdeen; Mar Forest, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire.

Var. *endopella* Cromb. in Grevillea i. 172 (1873).—Thallus subevanescent. Apothecia naked, black; hypothecium pale-brown; spores often 2-nucleolate; hymenial gelatine persistently bright blue with iodine.—Leight. Lich. Fl. ed. 3, 261. *L. endopella* Cromb. in Journ. Bot. ix. 178 (1871); Leight. Lich. Fl. 301.

Exsicc. Cromb. n. 84.

Differs, though perhaps only as a form, in the constantly naked apothecia, and more especially in the colour of the hymenial reaction. The apothecia are numerous and somewhat crowded.

Hab. On an old fir paling in an upland locality.—*B. M.* Glen Fender, Blair Athole, Perthshire (the only locality).

Var. *pithyophila* Nyl. Lich. Scand. 202 (1861).—Thallus as in the species, but usually in patches. Apothecia naked, convex, rugulose; hymenium sordid-bluish; hymenial gelatine bluish then sordid-violet with iodine.—Cromb. in Grevillea l. c. & in Journ. Bot. xi. 134 (1873); Leight. Lich. Fl. l. c. *L. asserculorum* var. β *pithyophila* Sommerf. Suppl. Fl. Lapp. 154 (1826).

Characterized chiefly by the peculiar colour of the hymenium. The apothecia are subminute and crowded.

Hab. On old fir palings in upland tracts.—*Distr.* Local and scarce among the S. and Central Grampians, Scotland.—*B. M.* Achmore, Killin, and Glen Fender, Blair Athole, Perthshire.

50. *L. mœstula* Nyl. in Flora li. 344 (1868).—Thallus effuse, thin, flat, subgranulose, dark-greyish (K —, CaCl —), at times nearly evanescent. Apothecia subminute, plane or convex, immarginate or with obsolete margin, black; hypothecium entirely dark-brown; epithecium colourless or rarely dark; spores ellipsoid, small, 7-8 μ long, 2.5-3.5 μ thick; hymenial gelatine pale-bluish then wine-red with iodine.—Cromb. in Journ. Bot. vii. 48 (1869); Lich. Brit. 69 & in Journ. Linn. Soc. xi. 483 (1871); Leight. Lich. Fl. 269; ed. 3, 268.

Exsicc. Cromb. n. 85.

Approaches *L. turgidula*, but differs in the darker hypothecium. The apothecia are numerous and generally crowded. The spermogones are frequent, especially in subathalline specimens; they are black, punctiform, somewhat prominent, with short sterigmata and oblong spermatia, 4-4.5 μ long, 1.5 μ thick.

Hab. On old oak palings in wooded upland situations.—*Distr.* Very local in S. and W. England, but plentiful where it occurs.—*B. M.* Billingshurst, Sussex; near Lyndhurst, New Forest, Hants; near Worcester.

51. *L. asserculorum* Ach. Lich. Univ. 170 (1810); Th. Fr. Lich. Scand. 473 (1874).—Thallus effuse, thin, minutely granulose-unequal, yellowish-green, at times almost evanescent. Apothecia small subinnate-sessile, convex, immarginate, becoming globose, brownish or brownish-black; hypothecium pale or darkish, the hymenium and towards the epithecium pale- or deeply-olivaceous or dull-brown; spores ellipsoid or oblong-ellipsoid, minute, 7-9 μ long, 3-3.5 μ thick; hymenial gelatine bluish then wine-red with iodine. *L. misella* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 177 (1866); Cromb. in Grevillea i. 172; Leight. Lich. Fl. ed. 3, 265. *L. anomala* var. *misella* Nyl. Lich. Scand. 202 (1861); *L. melanochozoa* Leight. ex Cromb. in Journ. Bot. ix. 178 (1871) & Lich. Fl. 267.

Exsicc. Cromb. n. 174.

Resembles a small state of *L. turgidula*, but differs in the colour of the thallus, in the smaller spores and other apothecial characters. The apothecia are numerous, occasionally rather crowded. Elsewhere the plant is known only from Scandinavia and Finland, where it is frequent.

Hab. On an old fir paling in a mountainous region.—*B. M.* Near Loch Tummel, Perthshire.

52. *L. mutabilis* Fée Ess. Crypt. ii. 105 (1837).—Thallus thin, membranaceous, smooth, whitish often limited by a narrow bluish-black line. Apothecia small, scattered, reddish-brown to brownish-black, sessile, plane with a thin entire margin; paraphyses slender, concrete; hypothecium colourless or yellowish; spores ellipsoid or ovate, rather large, 16-23 μ long, 8-9 μ thick; hymenial gelatine blue with iodine.—Carroll in Nat. Hist. Rev. vi. 526, t. xxix. figs. 2, 3 (1859); Mudd Man. 195; Cromb. Lich. Brit. 64; Leight. Lich. Fl. 298; ed. 3, 307.

Distinguished from others in this group by the smooth, subdeterminate thallus, and by the spores which are thick-walled and very distinct.

Hab. On the bark of trees.—*Distr.* Seen from only a few localities in S. and W. England and Ireland.—*B. M.* Tregawn, Withiel and near Penzance, Cornwall; Bovey Tracey, Hustyn's Wood and Torquay, Devon; Copse below the Wych, Gloucestershire; Dolgelly, Merioneth; Castle Bernard Park, Cork; Mangerton, Killarney and Blackwater Bridge, Kerry; near Ballinasloe, Galway; Mount Shannon, Limerick; Killaloe, Clare; Achill Island.

53. *L. rufofusca* Nyl. in Flora lii. 409 (1869).—Thallus effuse, whitish-yellow or brownish, thickish, forming a granulose crust, with a whitish hypothallus. Apothecia small, dark-reddish-brown, plane and marginate, becoming convex and immarginate; hypothecium yellow; paraphyses concrete; epithecium yellowish-brown; spores ellipsoid-oblong, $10-15\ \mu$ long, $5-6.5\ \mu$ thick; hymenial gelatine wine-red with iodine.—Leight. Lich. Flora ed. 3, 266. *Biatora rufofusca* Anzi Catal. Lich. Sondr. 76 (1860).

Exsicc. Larb. Lich. Hb. n. 102.

Hab. On the bark of trees.—*B. M.* Near Kylemore, Connemara, and Ballynahinch, Galway.

54. *L. ochrocoeca* Nyl. in Oefvers. Vet. Ak. Förh. 1860, 297 & Lich. Scand. 206.—Thallus effuse, thin, granulose, yellow-ochraceous; the granules small, firm, contiguous or subdispersed (K —, CaCl —). Apothecia small or moderate in size, sessile, plane, at length convex, reddish or rusty-brown, the margin obtuse or indistinct, paler; hypothecium pale; paraphyses concrete; spores oblong-fusiform, $7-10\ \mu$ long, $3-4\ \mu$ thick; hymenial gelatine bluish then, especially the asci, wine-red with iodine.—Mudd Man. 194; Cromb. Lich. Brit. 69; Leight. Lich. Fl. 261; ed. 3, 257.

Well distinguished from all allied species by the colours of the thallus and of the apothecia. It occurs elsewhere only in Norway. The thallus is occasionally evanescent, when the apothecia appear on darkened parts of the substratum. Our British specimens are well fertile.

Hab. On the trunks of pine trees in upland tracts of mountainous regions.—*Distr.* Very local and scarce in the W. Highlands of Scotland.—*B. M.* Inverouran, Argyll; Glen Falloch, Ben Lawers, and Black Wood of Rannoch, Perthshire; Dinish, Killarney, Kerry.

55. *L. symmictella* Nyl. in Flora li. 163 (1868).—Thallus obsolete, developed within the bark (hypophlœodal). Apothecia very small, adnate-sessile, convex, immarginate, at first waxy-yellow, then livid, somewhat shining; paraphyses colourless; epithecium granulose, yellowish; hypothecium colourless; spores oblong or oblong-ellipsoid, $4-6\ \mu$ long, $1.5-2.5\ \mu$ thick; hymenial gelatine bluish with iodine.—Cromb. in Grevillea xxii. 10. *Agryrium cæsium* Fr. Syst. Mycol. ii. 231 (1823).

Resembles an ecrustaceous state of *Lecanora symmicta* Ach., but from the character of the apothecia belongs to this section of *Lecidea*. Though no distinct thallus is visible, yet, as observed by Th. Fries (Lich. Scand. 433), gonidial groups are always present among the fibres of the substratum, especially in the neighbourhood of the apothecia.

Hab. On a decorticated fir tree in a mountainous region.—*B. M.* Glen Derry, Braemar, Aberdeenshire.

56. *L. cuprea* Sommerf. Suppl. Fl. Lapp. 165 (1826).—Thallus effuse, thickish, rimose-granulate, unequal, whitish (K —, CaCl —). Apothecia adnate, convex, immarginate, red-ochraceous or subferruginous, within brown (the hymenium paler); hypothecium pale then dull-brown; paraphyses concrete tawny or brownish; spores elongate- or ellipsoid-oblong, 9–21 μ long, 3–6 μ thick; hymenial gelatine faintly bluish then wine-red with iodine.—Cromb. Lich. Brit. 68 pro parte & in *Grevillea* xxii. 10; Leight. Lich. Fl. 273 pro parte; ed. 3, 273 pro parte.

Resembles *L. vernalis*, but differs in the more developed thallus and the characters given of the apothecia. These are at times conglomerate and difform.

Hab. On the ground in alpine situations.—*Distr.* Very local and scarce.—*B. M.* Ben Lawers, Perthshire; Ben Avon, Braemar, Aberdeenshire.

57. *L. Berengeriana* Th. Fr. Lich. Scand. 433 (1874).—Thallus effuse, thickish, granulose, continuous or diffract-rimose, the granules small, whitish or greenish-grey (K —, CaCl —). Apothecia submoderate, adnate, at first plane with thin, darker margin, at length convex, immarginate and somewhat difform, brown to dark; hypothecium brown; paraphyses colourless, capitate-incrassate and yellow to brown at the apices; spores oblong or ovoid, 10–18 μ long, 4–6 μ thick; hymenial gelatine wine-red with iodine.—Cromb. in *Grevillea* xxii. p. 10; Leight. Lich. Fl. ed. 3, 273. *L. cuprea* subsp. *Berengeriana* Cromb. Lich. Brit. 69 (1870); Leight. Lich. Fl. 273; ed. 3, 273 (1879), as var. *Biatora Berengeriana* Massal. Ric. Lich. 128, f. 254 (1852).

Closely related to the preceding, differing chiefly in the colour of the apothecia, the character of the paraphyses and the form of the spores.

Hab. On the ground at high altitudes in mountainous districts, very rare.—*B. M.* Ben Lawers and Mael Graedha, Perthshire; Ben-na-board, Braemar, Aberdeenshire.

Var. *lecanodes* Nyl. ex Cromb. in *Grevillea* xxii. 10 (1893).—Apothecia circumscissed, with a whitish epithalline margin.
L. cupreiformis var. *lecanodes* Nyl. ex Stirton in *Grevillea* ii. 71 (1873). *L. cuprea* var. *lecanodes* Leight. Lich. Fl. ed. 3, 273 (1879). *L. Berengeriana* var. *perileuciza* Nyl. ex Cromb. in Journ. Bot. xx. 275 (1882).

Well characterized by the thalline circle round the apothecia. The other characters are entirely as in the following, though the paraphyses are occasionally nearly simple.

Hab. Incrusting decayed mosses on the ground.—*B. M.* Near the summit of Ben Lawers, Perthshire (the only locality).

Subsp. *cupreiformis* Nyl. ex Hue in Rev. Bot. v. 92 (1888).—Thallus thin, subgranulate-concrescent, whitish. Apothecia reddish-brown or blackish; paraphyses septate, distinct at the apices; epithecium reddish; spores 10–18 μ long, 4–5 μ thick.—Cromb. in Grevillea xxii. 10 (1893). *L. cuprea* var. *cupreiformis* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 144 (1866); Cromb. Lich. Brit. 68; Leight. Lich. Fl. 273; ed. 3, 273. *L. vernalis* var. β *cupreiformis* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iii. 90 (1857). *L. cupreiformis* Nyl. in Flora li. 347 (1868).

Differs chiefly in the character of the paraphyses and in the colour of the apothecia.

Hab. On the ground in crevices of schistose rocks.—*B. M.* Above Loch-na-Gat, Ben Lawers, Perthshire.

58. *L. breadalbanensis* Stirton in Trans. Glasgow Soc. Nat. 1875, 87.—Thallus brownish-red to -black, thin, granulate. Apothecia brownish-red then blackish, rather small, crowded, or conglomerate, convex, immarginate, somewhat rugose; hypothecium pale or reddish in thin section; paraphyses indistinct involved in mucilage, slender, slightly clavate and reddish-brown at the apices; spores broadly ellipsoid, with a thick episore, 16–22 μ (rarely 25 μ) long, 11–14 μ thick; hymenial gelatine deep-blue with iodine.—Leight. Lich. Fl. ed. 3, 298.

Considered by Stirton as allied to the Arctic species *Lecidea tornøensis* Nyl. That species grows on pines, and thallus and apothecia show slight differences.

Hab. On mosses and hepatics in mountainous or Northern regions. *B. M.* Ben Lawers, Perthshire.

59. *L. sanguineoatra* Ach. Meth. 50 (1803) pro parte; Nyl. Lich. Par. Exs. n. 52 (1855), and in Act. Soc. Linn. Bord. sér. iii. 1, 352 (1856), pro parte.—Thallus effuse, thin, granulose or subcontinuous, greyish or greenish-grey (K —, CaCl —), at times subobsolete. Apothecia moderate, at first plane and thinly margined, soon becoming convex and immarginate, sanguineous-black or brownish-black; hymenium pale, interspersed with violet granules; paraphyses deep yellow or brownish towards the apices; hypothecium thick, brown or dark-red; spores ellipsoid or oblong, 10–19 μ long, 5–8 μ thick; hymenial gelatine bluish then wine-red or violet with iodine.—Mudd Man. 198; Cromb. Lich. Brit. 67; Leight. Lich. Fl. 268; ed. 3, 267 pro parte. *Lichen sanguineoater* Wulfen in Jacq. Coll. iii. 117 (1789) ?

A marked feature is, as stated by Th. Fries (Lich. Scand. 436), the presence of bluish or violet-coloured granules among the paraphyses. The apothecia are often crowded and at times subconfluent.

Hab. Incrusting mosses on rocks and boulders, rarely on dead wood, in mountainous regions.—*Distr.* Only here and there in N.

England (Cleveland, Yorkshire), N. Wales, and on the Grampians, Scotland; and in S. Ireland.—*B. M.* Birdlip Common, Gloucestershire; Nannau, Dolgelly, Merioneth; Levens Park, Westmorland; Achosragan Hill, Appin, Argyll; Loch Tay, Glen Falloch and Ben Lawers, Perthshire; Canlochan, Forfarshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Assynt, Sutherland; Bantry, Cork.

Subsp. *atrofusca* Nyl. ex Wainio in Medd. Soc. Faun. & Fl. Fenn. iii. 110 (1878).—Thallus as in the species. Apothecia small, plane, margined; the margin at times slightly flexuose, at length somewhat convex and subimmarginate, brownish-black or black: hypothecium brownish or brownish-black; spores oblong, 10–14 μ long, 5–6 μ thick.—Cromb. in Grevillea xxii. 10. *L. atrofusca* Mudd Man. 198 (1861); Leight. Lich. Fl. ed. 3, 259. *Biatora atrofusca* Flot. in Hepp Exs. n. 268 (1857). *Lecidea fusca* Cromb. Lich. Brit. 68 (1870) (non Schær.); Leight. Lich. Fl. 268; ed. 3, 267.

Ersicc. Dicks. Hort. Sicc. n. 99 (as *Lichen muscorum* Linn. fil.).

Differs in the planer smaller and darker apothecia, as also in the rather smaller spores. When growing at high elevations the thallus is darker, almost blackish, and but sparingly fertile. The spores are occasionally spuriously 1-septate.

Hab. On mossy rocks and mossy trunks of old trees in hilly and mountainous regions.—*Distr.* Local and scarce in Central England, N. Wales, the Highlands of Scotland, and W. Ireland.—*B. M.* Matlock, Derbyshire; Dolgelly, Merioneth; Barcaldine, Argyll; S. of Loch Tay and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; near Kylemore, Connemara, Galway.

Form *congesta* Cromb. ms.—Apothecia minute, convex, crowded, botryose, immarginate; otherwise as in the type.

A rather singular form, characterized by the aggregate apothecia, though in the same plants these are occasionally normal and scattered. It is referred to by Th. Fries Lich. Scand. 436 (as rarely *botryoso-conferta*).

Hab. Incrusting mosses on rocks in mountainous districts.—*B. M.* Craig Calliach, Perthshire; Ben Bulbin, Sligo.

Var. *Templetoni* Wainio in Medd. Soc. Faun. & Fl. Fenn. x. 38 (1883).—Thallus as in the species. Apothecia submoderate, black, slightly shining; hypothecium thickish, brownish or reddish-black; spores oblong or obtusely fusiform-oblong, simple or thinly 1-septate, 10–15 μ long, 5–6 μ thick.—*Lecidea Templetoni* Tayl. in Mackay Fl. Hib. ii. 123 (1836); Leight. Lich. Fl. 312; ed. 3, 329. *L. sabuletorum* var. *Templetoni* Cromb. Lich. Brit. 71 (1870). *Bilimbia Templetoni* Mudd Man. 189 (1861).

Has been usually regarded by British authors as a distinct species. It differs chiefly in the colour of the rather larger apothecia and the frequently uniseptate or pseudo-septate spores. The violet-coloured granules are present in the epithecium as in the species.

Hab. Incrusting decayed mosses on rocks and boulders in upland situations.—*Distr.* Seen from only a very few localities in N. Wales,

the S. Grampians, Scotland, and N. Ireland.—*B. M.* Cader Idris, Merioneth; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Invermoriston, Invernessshire; Armagh; near Belfast, Antrim; Doughruagh Mt., Galway; Dunkerron, Kerry.

60. *L. fuscorubens* Nyl. ex Salw. in Trans. Edin. Bot. Soc. vii. 551 (1863).—Thallus effuse, very thin, smooth, sordid-greyish or yellowish (K —, CaCl —); often obsolete. Apothecia small, sessile, plane, marginate, then convex and immarginate, brownish or black, reddish-brown when moist; hypothecium thick, brown; epithecium pale-reddish; spores ellipsoid, 10–14 μ long, 5–9 μ thick; hymenial gelatine bluish then wine-red with iodine.—Cromb. Lich. Brit. 68 pro parte; Leight. Lich. Fl. 300 pro parte; ed. 3, 310. *L. ochracea* Wedd. in Mém. Soc. Sci. Nat. Cherb. xvii. 369 (1873); Cromb. in Journ. Bot. xiii. 141 (1875); Leight. Lich. Fl. ed. 3, 251. *L. subochracea* Nyl. Lich. Env. Paris Suppl. 5 (1897). *Biatora fuscorubens* Nyl. in Bot. Not. 1853, 183 pro parte. *B. ochracea* Hepp Flecht. Europ. n. 263 (1851).

L. fuscorubens was considered by Nylander as possibly a variety or subspecies of *L. sanguineotra* (Lich. Env. Paris, 79). It differs in the absence of the purple hymenial granules and in other characters. Th. Fries (Lich. Scand. 440) has rightly judged *L. ochracea* to be synonymous. They differ only in the occasional yellowness of the very thin thallus of the latter. As in other calcicolous lichens, the thallus is not always visible, being evidently immersed in the rock (*L. ochracea* f. *ecrustacea* Larb. in Leight. l. c.).

Exsicc. Larb. Lich. Hb. nos. 64, 137; Johns. n. 336.

Hab. On calcareous rocks and flints in maritime and upland districts.—*Distr.* Common on oolitic rocks and Silurian limestone in W. England; here and there in the British Isles probably overlooked.—Downs, Lewes and Hastings, Sussex; Portland, Dorset; Staple Fitzpaine, Somerset; near Cheltenham, Gloucestershire; Epping Forest, Essex; Dolgelly, Merioneth; Colwyn Bay, Denbigh; Kentmere, Levens Park and Cunswick Scar, Westmorland; Barrowmouth, Cumberland; Ben Lawers, Perthshire; Achosragan Hill, Appin, Argyll; near Cork.

61. *L. immersa* Ach. Meth. 34 (1803).—Thallus effuse, very thin, leprose, white or greyish-white, mostly immersed (K —, CaCl —). Apothecia medium-sized, immersed in depressions or pits (foveolate), plane, blackish, cæcio-pruinose or naked, within greyish in the middle, the margin thin, evanescent; paraphyses concrete; epithecium and hypothecium more or less brownish; spores ellipsoid or subellipsoid, 12–18 μ long, 7–10 μ thick; hymenial gelatine bluish then wine-red with iodine.—S. F. Gray Nat. Arr. i. 467; Hook. in Sm. Engl. Fl. v. 179; Tayl. in Mackay Fl. Hib. ii. 125. *L. calcivora* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 381 (1856); Mudd Man. 203; Cromb. Lich. Brit. 81; Leight. Lich. Fl. 300; ed. 3, 310. *Lichen immersus* Web. Spicil. Fl. Goett. 188 (1778) pro parte; Engl. Bot. t. 193; With. Arr. ed. 3, iv. 6 pro parte. *L. calcivorus* Ehrh. Crypt. Exs. n. 244 (1793).

Exsicc. Bohl. n. 49 (plate); Leight. n. 94; Cromb. n. 184.

The thallus is very rarely visible, being almost always immersed in the substratum to a depth of at least 8 mm., when it is indicated by more or less scattered gonidia and hyphæ immersed in the rock. The apothecia when young resemble those of *Verrucaria immersa*, with which it is then apt to be confounded. Under the apothecia, the pits (fossulae), as stated by Nylander, present minute confused colourless thalline cellules. Occasionally the thallus is intersected by black hypothallic lines (f. *intercincta* Cromb. ms.). Bouly de Lesdain (Bull. Soc. Bot. Fr. lii. 615, 1905) gives spore-length as 16–21 μ , rarely 24 μ .

Hab. On calcareous rocks and cretaceous stones in maritime and upland tracts.—*Distr.* Here and there in England and N. Wales, rare in the Highlands of Scotland and in S.E. Ireland.—*B. M.* Shere, Surrey; above Anstey's Cove, Torquay, and Elburton, near Plymouth, Devon; Horton Down, Kent; Weston-super-Mare and Bathampton, and near Bath, Somerset; Cunning Dale, and Deep Dale (f. *intercincta*), near Buxton, Derbyshire; Eglwyseg rocks, near Llangollen, Denbighshire; Great Orme's Head, Carnarvonshire; Craig-y-Rhiw, Oswestry and Llanymynach, Shropshire; near Thirsk, Yorkshire; Teesdale, Durham; Levens Park and Cunswick Scar, Westmorland; Lamplugh, Cumberland; Island of Lismore, Argyll; Ben Lawers, Perthshire; Middleton, Cork; Dromoland, Clare; Glenarm, Antrim.

62. *L. Metzleri* Th. Fr. Lich. Scand. 478 (1874).—Thallus effuse, thin, whitish or greyish-white, usually obliterated (K —, CaCl —). Apothecia small, innate in pits (foveolate), becoming slightly prominent, blackish, naked, plane and thinly margined, at length convex, immarginate; paraphyses conglutinate, dark-brown at the apices; hypothecium pale-brownish; spores broadly oblong, 18–28 μ long, 6–12 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Leight. Lich. Fl. ed. 3, 311. *Biatora Metzleri* Koerb. Parerg. Lich. 162 (1860).

Very similar to the preceding, for which it might readily be taken. It differs, however, externally in the apothecia being smaller, less deeply imbedded, dark-purplish when moistened, constantly epruinose; and internally by the much larger spores. A closely allied plant is *L. chondroides* (Massal.) Nyl., recorded as British by Leighton (Lich. Fl. ed. 3, 253), but Leighton's specimen belongs to the present species.

Hab. On cretaceous stones and calcareous rocks in maritime and upland tracts.—*Distr.* Only a very few localities in S. England and S. Wales.—*B. M.* The Downs, Lewes, Poyning, Beeding and Seddlescomb, Sussex; Shere, Surrey; Yatton, Somerset; Giltar Point, Tenby, Pembrokeshire; Breedon Hill, Worcestershire; Levens Park, Westmorland.

63. *L. cyclisca* Malbr. in Bull. Soc. Sci. Nat. Rouen xvii. 131 (1881).—Thallus thick, cartilaginous, subdeterminate, unequal, glaucous-cinereous- or white-furfuraceous. Apothecia minute, blackish-brown, plane, immarginate, reddish when moistened and becoming convex; hypothecium colourless; paraphyses indistinct, reddish-brown upwards; spores ellipsoid-oblong, with a thick epispore, large, 16–20 μ long, 9–10 μ thick.—*Biatora cyclisca* Massal. Symm. Lich. 40 (1855).

Somewhat like *L. leptostigma*, but very distinctive on account of the large spores and the thick uneven thallus, which becomes pitted after the disappearance of the apothecia. The apothecia are originally described as irregularly grouped in small circles, a character not well marked in our specimen.

Hab. On limestone.—*B. M.* Bathampton Downs, Wiltshire.

64. *L. Bauschiana* A. L. Sm.—Thallus thin, filmy or furfuraceous, pale-tawny. Apothecia minute, convex, yellowish-brown to dark-brown or black; hypothecium brownish-yellow or colourless in thin section; paraphyses conglutinate, the epithecium colourless or brownish; spores ellipsoid, minute, $8\ \mu$ long, $4\ \mu$ thick or smaller.—*L. dilutiuscula* Nyl. in *Flora* lxx. 308 (1876); Leight. *Lich. Fl.* ed. 3, 256 (1879). *Biatora Bauschiana* Koerb. *Parerg. Lich.* 157 (186), *fide* Nyl. *Lich. Env. Paris*, 93 (1896).

In the previous edition this species had been associated with *L. sylvicola* var. *indigula*. Some of the specimens determined as *L. dilutiuscula* are now included here. The thallus and apothecia closely resemble those of *L. sylvicola*.

Hab. On schistose rocks.—*Distr.* Rare in S. England.—*B. M.* Near Ditcham Cove and near Buckfastleigh, S. Devon.

65. *L. rusticula* Nyl. in *Flora* xlix. 371 (1866).—Thallus effuse, granulate, the granules depressed-convex, subcrenate, smooth, glaucous-white (K + yellowish, CaCl + yellow). Apothecia minute, somewhat plane, margined, black, the margin entire, at length obliterated; paraphyses concrete; epithecium vaguely brownish; hypothecium brown; spores ellipsoid, $10\text{--}15\ \mu$ long, $5\text{--}8\ \mu$ thick; hymenial gelatine deep-blue then sordid-yellowish with iodine.—Leight. in *Ann. Mag. Nat. Hist.* xix. 407 (1867); *Cromb. Lich. Brit.* 84; Leight. *Lich. Fl.* 271; ed. 3, 272.

Considered by Nylander to be related to *L. expansa*, but the character of the apothecia indicates its position in Sect. *Biatora*. These are at first concave with an obtuse margin. In the small specimen seen they are few and scattered. Spermatogones have not been detected.

Hab. On quartzose rocks in mountainous districts.—*Distr.* Found only very sparingly in N. Wales and N.W. Ireland (Salrock Road, Connemara, Galway *fide* Leight. *Lich. Fl.* ed. 3 l. c.).—*B. M.* Giant's Pebbles, Cader Idris, Merioneth.

66. *L. rusticella* Nyl. in *Flora* lxi. 245 (1878).—Thallus effuse, thin, subleprose, whitish-ochraceous (K + reddish, CaCl —). Apothecia minute, convex, immarginate, black, opaque, dark, within; paraphyses concrete; epithecium and hypothecium brown or brownish; spores suboblong, $6\text{--}9\ \mu$ long, $2\cdot5\text{--}3\cdot5\ \mu$ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*Cromb. in Grevillea* vii. 97; Leight. *Lich. Fl.* ed. 3, 252.

Exsicc. Johns. n. 504.

Comparable with *L. rusticula*, but distinct in the character of the thallus and in the smaller spores. The colour of the thallus, which Nylander, *l. c.*, says may be normally greyish, is evidently due to suffusion by peroxide of iron. The apothecia are rather scattered.

Hab. On schistose ferruginous stones of a wall in upland situations.—*B. M.* Herdhouse Fell, Cumberland; Tullywhee Bridge, Connemara, Galway (also reported from Ellersgill, Teesdale, Durham).

67. *L. livescens* Leight. in *Grevillea* iv. 78 (1875).—Thallus white, granulose or granulate-verrucose (K —, CaCl + pale-reddish), the granules scattered and dispersed on a black predominating hypothallus. Apothecia scattered, sessile on the hypothallus, round or angular-diform, concave with a thick black prominent entire or flexuose margin, the disc of a pale grey colour; hypothecium blackish-brown; paraphyses thick, brown at the apices; spores linear-oblong, minute, 7–8 μ long, 3 μ thick. Leight. *Lich. Fl.* ed. 3, 276.

Hab. On rocks.—*B. M.* Doughruagh Mt., Connemara, Galway (the only locality).

68. *L. antrophila* Larb. ex Leight. in *Trans. Linn. Soc.* ser. 2, i. 242, t. xxxiii. figs. 10 & 11 (1878).—Thallus yellowish-green, thin, effuse, pulverulent-furfuraceous (K —, CaCl —). Apothecia yellowish-red, small, scattered, sessile, excessively convex and prominent, with only a pale narrow margin when wetted; hypothecium thick, dark yellowish-red; paraphyses indistinct, colourless; spores linear or linear-oblong, minute, 9 μ long, 2.5 μ thick; hymenial gelatine pale-blue with iodine.—Leight. *Lich. Fl.* ed. 3, 252.

Hab. On the interior of caves.—*B. M.* Mwellan near Kylemore, Galway (the only locality).

69. *L. picila* Leight. *Lich. Fl.* ed. 3, 251 (1879).—Thallus dirty yellowish-white, thin, effuse, furfuraceous. Apothecia black, sessile, plane or hemispherical, confluent, marginate, when wet transparent pale-brown; hypothecium black; paraphyses thickish, coherent; spores minute oblong, 9 μ long, 2–3 μ thick.—*Biatora picila* Massal. *Misc. Lich.* 38 (1856).

Exsicc. Larb. *Lich. Hb.* n. 264.

The spores in the British specimens are larger than the size given by Massalongo, measuring up to 12 μ long; in the specimens examined from Craig Tulloch and Twelve Pins, they are mostly simple but occasionally 1-septate.

Hab. On rocks in upland regions.—*Distr.* Somewhat local and rare in the Scottish Highlands and S.W. Ireland.—*B. M.* Craig Tulloch, Blair Athole, Perthshire; Derryclare and Twelve Pins, Connemara, Galway.

70. *L. indigula* Nyl. in *Flora* lx. 563 (1877).—Thallus effuse, thin, continuous, rugulose, whitish, often scarcely visible (K —, CaCl —). Apothecia small, subprominent, plane, thinly margined, blackish; paraphyses slender, colourless at the apices; hypothecium reddish, the upper subhymenial portion thick, blackish-brown; spores ellipsoid, 13–16 μ long, 6–7 μ thick; hymenial gelatine pale-bluish then wine-red with iodine.—Cromb. in *Grevillea* vi. 112; Leight. *Lich. Fl.* ed. 3, 307.

Considered by Nylander to be related to *L. sanguineoatra*, but separated by the internal characters of the apothecium. In the single small specimen seen, the apothecia are numerous, subminute, at length convex and immarginate.

Hab. On schistose stones of a wall in a mountainous district.—*B. M.* Glencorbot, near Kylemore, Galway (the only locality).

71. *L. botryiza* Nyl. ex Stirton in Grevillea ii. 71 (1873).—Thallus effuse, thin, minutely areolate-rimulose or as if minutely appressed-squamulose, greenish-white (K —, CaCl —). Apothecia small, superficial, somewhat prominent, convex, simple or conglomerate and verrucose, brown; paraphyses coherent; epithecium colourless; hypothecium brown; spores ellipsoid, 6–9 μ long, 3.5–4.5 μ thick; hymenial gelatine tawny-wine-red with iodine.—Leight. Lich. Fl. ed. 3, 247.

Closely allied to *L. botryocarpa* Nyl., which does not occur in Great Britain, externally agreeing with it in the thallus and apothecia. When conglomerate, the hypothecia are confluent in one common brown hypothecium in each glomerule of the apothecia. Specimen not seen.

Hab. On schistose rocks in a mountainous district.—*Distr.* Extremely local and scarce on the S. Grampians, Scotland (Ben Voirlich, Perthshire).

72. *L. semipallens* Nyl. in Flora lix. 234 (1876).—Thallus effuse, thin, rimulose, sordid-whitish, whitish or glaucous (K + yellowish, CaCl —). Apothecia small, convex, immarginate, pale or livid; epithecium and hypothecium colourless; spores minute, ellipsoid, 6–9 μ long, 3.5–4.5 μ thick; hymenial gelatine tawny-wine-red with iodine.—Cromb. in Grevillea v. 26; Leight. Lich. Fl. ed. 3, 298.

Exsicc. Larb. Lich. Hb. n. 68.

An inconspicuous plant; the apothecia are more or less scattered, One of the specimens seen is tinged with peroxide of iron.

Hab. On quartzose and schistose rocks in streams.—*Distr.* Found only in W. Ireland.—*B. M.* Near Kylemore, Lough Inagh and Twelve Pins, Connemara, Galway.

73. *L. callicarpa* Larb. ex Leight. Lich. Fl. ed. 3, 266 (1879).—Thallus pale-whitish sulphur-coloured, pulverulent granular, effuse (K —, CaCl + reddish). Apothecia pallid, flesh-coloured, minute, clustered or scattered, convex; hypothecium colourless; paraphyses coherent, apices colourless; spores not seen. Specimen not seen.

Very similar to the preceding, except in the thalline reaction. The absence of spores makes identification almost impossible.

Hab. On damp perpendicular rocks at Glencorbot, near Kylemore, Connemara, Galway.

74. *L. poliodes* Nyl. in Flora lviii. 10 (1875).—Thallus blackish or greenish-grey, thin, opaque, wrinkled-granulate. Apothecia

minute, blackish, convex, immarginate; hypothecium dark-reddish; paraphyses concrete, the epithecium blue; spores ellipsoid, small, 7-9 μ long, 2.5-4.5 μ thick; hymenial gelatine wine-red with iodine. Spermogones light-coloured; spermatia straight, 5-6 μ long, 1 μ thick.

Exsicc. Larb. Lich. Hb. n. 227.

Hab. On rocks in shady streams.—*B. M.* Above Lough Feagh, Connemara, Kerry.

75. *L. paucula* Nyl. in Flora lix. 573 (1876).—Thallus effuse, very thin, smooth, continuous, greenish or greyish-white (K —, CaCl —). Apothecia minute, convex, immarginate, brown; hypothecium thick, brownish-black; paraphyses colourless at the apices; spores ellipsoid, 6-7 μ long, about 3 μ thick; hymenial gelatine tawny-wine-coloured with iodine.—Cromb. in Grevillea v. 106; Leight. Lich. Fl. ed. 3, 249.

Exsicc. Larb. Lich. Hb. n. 223.

Near to *L. botryoides* Nyl. of Finland. The two specimens seen are well fertile, the apothecia not being very black, as stated by Leighton.

Hab. On schistose rocks in streams in mountainous districts.—*Distr.* Found only in N.W. Ireland.—*B. M.* Near Kylemore and Twelve Pins, Connemara, Galway.

76. *L. valentior* Nyl. in Flora lx. 229 (1877).—Thallus sub-effuse, thin, continuous, rimose, greyish or somewhat greenish (K —, CaCl —). Apothecia small, subplane or convex, immarginate or often obtusely submarginate, brown or dark-brown, the margin when present paler; hypothecium dark-brown; spores 12-17 μ long, 6-8 μ thick; hymenial gelatine bluish then violet with iodine.—Cromb. in Grevillea vi. 19; Leight. Lich. Fl. ed. 3, 267.

Hab. On wet shady rocks in a mountainous region.—*B. M.* Lough Inagh, Galway (the only locality).

77. *L. dasæa* Stirton in Scott. Nat. v. 219 (1880).—Thallus reddish-brown or brownish-black, loosely adherent, soft, granulate-furfuraceous or isidioid, deeply areolate almost as in *L. furvella*, but the granules sometimes thin and scattered. Apothecia brownish-black, small, .2-.3 mm. wide, concave and acutely marginate, becoming plane with the margin depressed; hypothecium dark- or reddish-brown; paraphyses irregular, not distinct, reddish-brown at the apices, not clavate; spores globose, minute 3.5-4.5 μ in diameter; hymenial gelatine more deeply wine-red with iodine.—Monogr. Part i. 471 (1918).

Considered by Stirton as akin to the following, but very distinct both in thallus and apothecia; the latter, as in *L. antiloga*, are soft and biatorine. It is placed here in a group of species that have globose or subglobose spores, an unusual character in *Lecidea*.

Hab. On fallen wood.—*B. M.* Near Ben Lawers, Perthshire (the only record).

78. **L. antiloga** Stirton in Scott. Nat. iv. 164 (1877).—Thallus nearly evanescent. Apothecia black, minute, adnate, plane with a thickish margin; hypothecium colourless, darker upwards; paraphyses indistinct, but clavate and greenish-black at the tips; spores globose, minute, $4-5.5\ \mu$ in diameter; hymenial gelatine blue then dark violet with iodine.—Leight. Lich. Fl. ed. 3, 309.

A very distinct species. The thallus is reduced to scattered hyphæ and gonidia among the superficial rather loose fibres of the wood.

Hab. On decorticated wood.—*B. M.* Road to Loch-an-Eilan, Aviemore, Inverness-shire.

79. **L. geophana** Nyl. Lich. Scand. 212 (1861).—Thallus thin, greenish or greyish, indistinct, consisting of a confused layer of hyphæ and algæ. Apothecia minute, plane or convex, about $\cdot 250$ mm. in diameter, immarginate, dark-brown; hypothecium narrow, brownish-red; epithecium brownish-red; paraphyses few, slender, conglutinate, scarcely visible; asci oblong-clavate, about $75\ \mu$ long, $12\ \mu$ wide, 12–18-spored; spores globose or slightly irregular in size and form, with a distinct epispore, $6-8\ \mu$ in diameter; hymenial gelatine blue then sordid-wine-red with iodine.—*L. pleiospora* A. L. Sm. Monogr. ii. 352 (1911).

Classified by Nylander as allied to *L. granulosa*. It is placed here with other species that have globose spores. *L. pleiospora* has been included under *L. geophana*, as the only real difference between the two species is the halonate character of the spores in *L. pleiospora*, and that character is probably a stage of development. There is also some difference in locality, most specimens of *L. geophana* occurring in northern or alpine regions, but that also seems insufficient to separate the species.

Hab. On argillaceous or sandy soil. *Distr.* Generally in northern regions, but found also in southern localities.—*B. M.* Ashey Down, near Ryde, I. of Wight; Little Bowden, Northamptonshire; Sand-dunes, Freshfield, north Lancashire; on tableland, S. of Glen Callater, Aberdeenshire.

80. **L. calpodes** Stirton in Trans. Glasg. Soc. Field Nat. 1875, 88.—Thallus dark-grey, cracked-areolate, the areolæ somewhat convex, contiguous, or dispersed. Apothecia black, minute, numerous, innate-sessile, concave, suburceolate, acutely margined, becoming plane; hypothecium brown or pallid brown, thin; paraphyses irregular, indistinct, branching, brownish at the apices; spores ellipsoid, or almost globose, $7-9\ \mu$ long, $6-7\ \mu$ thick; hymenial gelatine slightly blue then wine-red with iodine.—Leight. Lich. Fl. ed. 3, 288. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton at Killiecrankie, Perthshire.

81. **L. rubidula** Nyl. in Flora lxvii. 214 (1884).—Thallus effuse, scarcely visible. Apothecia small, subglobose, ferruginous red; hypothecium not dark; paraphyses slender, not well discrete;

epithecium tawny-ochraceous (K + purplish); asci saccate, spores globose 6-7 μ diam.; hymenial gelatine pale-bluish then tawny-wine-red with iodine. Specimen not seen.

A well-marked species, somewhat resembling *Biatorella ochrophora*. Nylander observes that the hymenium and hypothecium contain parietin, though in less degree than the epithecium. Originally found in Behring's Straits, it has since been detected sparingly in Yorkshire (*vide* Nyl. Lich. Labuan et Singapore, 44 (1891)).

Hab. On calcareous rocks in a hilly district.—*Distr.* Only in N. England.

82. *L. leptostigma* Nyl. in Flora li. 344 (1868).—Thallus subdeterminate, somewhat thick, scarcely cracked, greyish-white (K —, CaCl —). Apothecia small, innate, thin, gregarious, brownish-black; paraphyses thickened upwards, sordid-yellow towards the apices; hypothecium pale yellowish; asci cylindrical, spores globose or globose-ellipsoid, uniseriate in the ascus, 5-9 μ in diameter; hymenial gelatine not tinged with iodine.—Cromb. in Journ. Bot. vii. 49 (1869), & Lich. Brit. 76; Leight. Lich. Fl. 356; ed. 3, 385.

The thallus and apothecia are somewhat similar to *L. cyclisea*, but is distinguished by the form of the spores. Nylander has stated that the thallus in all probability is not proper, and in that case it might be classified as parasitic. The apothecia are numerous and crowded.

Hab. On a mica-schistose boulder in a subalpine situation.—*B. M.* Near Loch-na-gat, Ben Lawers, Perthshire.

§ iii. *EULECIDEA* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 157 (1866). Pl. 6. Thallus crustaceous, very variable, at times evanescent or absent. Apothecia mostly carbonaceous (lecideine), plane or convex, black or brownish-black; asci usually 8-spored; spores simple, rarely faintly 1-septate, colourless or sometimes with a brownish tinge. Spermatogones with simple sterigmata and straight or rarely arcuate spermatia.

There is no clear line of demarcation between the two sections *Biatora* and *Eulecidea*, though in general the difference is easily recognized: in the latter the apothecia are distinguished by their darker and more carbonaceous character; occasionally, however, they are at some stage of development lighter in colour and rather soft. One very striking character is the darker colour of the tips of the paraphyses (epithecium). The species grow, with few exceptions, on rocks, stones or earth, and are very abundant in upland or alpine regions.

Species of *Eulecidea* are arranged here in two groups according to the colour of the hypothecium.

1. (83-133). Hypothecium colourless or yellowish or pale brownish. (See also *L. aglaea* and *L. armeniaca*.)

83. *L. sporadiza* Stirton in Grevillea iii. 33 (1874).—Thallus yellow or greenish-yellow, granulate, the granules often con-

glomerate or pulverulent (K + yellow, CaCl + orange-red). Apothecia black, sessile, small or medium-sized, plane, marginate; hypothecium colourless; paraphyses few, irregular, indistinct, vaguely dark at the apices; spores ellipsoid, small, 6–7 μ long, 4–6 μ thick; hymenial gelatine pale-blue then sordid with iodine.—Leight. Lich. Fl. ed. 3, 266.

Considered by Stirton to be allied to *L. neglecta*. Its affinity seems rather with the *L. parasema* group. In the specimen (from Hb. Stirton) in the British Museum herbarium the granules are conglomerate and almost subsquamulose. The asci are about 35 μ long, 7 μ wide; the paraphyses, as shown on the application of potash, are slender, septate, branched at the tips, and end in chains of minute globose cells.

Hab. On old worked wood.—*B. M.* Glen Lochay, Killin, Perthshire. Recorded by Stirton also from Grantown, Inverness-shire.

84. *L. dubia* Turn. & Borr. ex Hook. in Sm. Engl. Fl. v. 176 (1833).—Thallus effuse subleprose, pale-yellowish-green, extremely pulverulent or almost smooth and minutely areolate (K + yellow, CaCl + orange-red). Apothecia black, usually numerous, scattered or confluent, subsessile, plane, becoming convex and immarginate, the disc smooth or granular; hypothecium brownish; paraphyses distinct, dark-bluish-green at the apices, the colour extending downwards; spores ellipsoid, 12–14 μ long, 5–7 μ thick; hymenial gelatine deep-blue with iodine.—Tayl. in Mackay Fl. Hib. ii. 120; Leight. Lich. Fl. 263; ed. 3, 260. *Lichen dubius* Sm. Engl. Bot. t. 2547 (1814).

Exsicc. Larb. Lich. Hb. n. 143 (as *Lichen leproides*); Bohl. n. 92 (doubtful).

Closely allied to *L. parasema*. It differs from that species in the powdery thallus and in the somewhat smaller spores. The type specimen was renamed by Nylander *L. parasema* var. *flavens*, and another specimen in the Sowerby herbarium was similarly labelled by Crombie. Our specimens form a well-connected series in which the surface of the thallus varies from being almost smooth to completely powdery. They also differ from *L. parasema* in the larger and more crowded apothecia, and from var. *flavens* in the rather denser powdery thallus.

Hab. On old palings.—*Dist.* Local and not uncommon in the S. of England, extending as far north as Cambridgeshire.—*B. M.* Near Penzance, Cornwall; Penshurst, Kent; near Isfield, Sussex; Shere, Surrey; Ulting and Chalk End, Essex; Finchley, Middlesex; Great Comberton, Worcestershire; Oakington, Cambridgeshire; Overton near Ludlow, Shropshire.

85. *L. parasema* Ach. Meth. Lich. 35 (1803) pro parte; Nyl. in Bot. Not. 1852, 175 & Lich. Scand. 217 pro parte.—Thallus determinate or subdeterminate, thin or thinnish, granulose or rather smooth, whitish or grey-coloured (K + yellowish, CaCl —, K (CaCl) + orange-red); hypothallus black, at times limiting the thallus. Apothecia small, usually numerous and crowded, at

first plane and thinly margined, at length somewhat convex and immarginate, brownish-black; paraphyses subcoherent, dark-bluish-green at the apices; hypothecium brownish; spores ellipsoid, 10-18 μ long, 5-9 μ thick; hymenial gelatine bluish then dark-violet with iodine.—Hook. in Sm. Engl. Fl. v. 176 (1833); Tayl. in Mackay Fl. Hib. ii. 119; Mudd Man. 200 pro parte; Cromb. Lich. Brit. 77 pro parte; Leight. Lich. Fl. 269; ed. 3, 268 (excl. saxicolous vars.). *Lichen parasemus* Ach. Lich. Suec. Prod. 64 (1798) pro parte; Sm. Engl. Bot. t. 1450 pro parte. *Lichenoides leprosum*, *crusta cinereo-virescente*, &c., Dill. Hist. Musc. 126, t. 18, f. 3 (1741) pro parte.

Exsicc. Leight. nos. 308, 327, 391 (as *L. enteroleuca*); Johns. nos. 346, 379.

The species as here understood includes only corticolous forms. Those growing on rocks, formerly considered as varieties, differ considerably in the thallus or in the apothecia, and are dealt with under the species that follow. When the thallus is almost or quite evanescent it is var. *ecrustacea* Leight. Lich. Fl. ed. 3, 270. A number of other varieties and forms have been described chiefly on thalline characters: those that follow have been recognized by British lichenologists.

Hab. On the trunks of trees, and on old palings.—*Distr.* Common throughout the British Isles.—*B. M.* Ullacombe, near Bovey Tracey and Torquay, Devon; near Lyndhurst, Hants; Shere, Surrey; Langford, Staunsted, Mount Fitchet Park, Sussex; Beeleigh, near Maldon, Ulting and Hadleigh Wood, Essex; near Malvern, Worcestershire; Gopsal Park, Leicestershire; Limekiln Wood, Wrekin, Caer Caradoc and Llanymynech, Shropshire; Hart Hill and Matlock, Derbyshire; Cym Bychan, Dolgelly and Barmouth, Merioneth; Trefriw, Carnarvonshire; Castle Howard Park and Easby, Yorkshire; trees on Roman wall, Northumberland; Calder Bridge, Cumberland; Levens, Westmorland; Falls of Bruar, Blair Athole and Glen Ogle, Perthshire; Barcaldine, Lorne and Appin, Argyll; Moidart, Ross-shire; Banchorry, Aberdeenshire; Rostellan, Cork; Connemara, Galway.

Form *tabescens* Stizenb. in St. Gall. Ber. Nat. Ges. 1882, 432.—Thallus effuse, very thin, subleprose or subrimulose, greyish- or yellowish-green; hypothallus indistinct. Apothecia adnate or at times subinnate, convex, immarginate, difform, livid-brown.—Var. *tabescens*, Leight. Lich. Fl. ed. 3, 269 (1879). *Biatora tabescens* Koerb. Syst. Lich. Germ. 203 (1855).

Exsicc. Leight. n. 329.

Differs in the less-developed thallus, the absence of a hypothallus and in the colour of the more or less difform apothecia.

Hab. On smooth trunks of beech trees in wooded upland tracts.—*Distr.* Seen from only a very few localities in S. and N. England.—*B. M.* Lyndhurst, New Forest, Hants; near Frampton, Dorsetshire; Airyholme Wood, Cleveland, Yorkshire; Isle of Man.

Var. *flavens* Nyl. Lich. Scand. 217 (1861).—Similar to the type but the thallus yellow and poorly developed, the apothecia

internally whitish, and the hypothecium almost colourless.—Cromb. Lich. Brit. 77; Leight. Lich. Fl. 270; ed. 3, 269.

Hab. On the trunks of trees, rarely on soil.—*Distr.* Rare in the southern counties of England and in E. and N. Scotland, not recorded from the Channel Islands or from Ireland.—*B. M.* Ilsham Valley, Torquay, Devon; New Forest, Hants; Windsor Great Park, Berks; Portlethen, Forfarshire; Glen Girnac, Braemar, Aberdeenshire; Applecross House, Ross-shire.

Var. *elæochroma* Ach. Meth. 36 (1803) pro parte; Nyl. Lich. Scand. 217.—Thallus determinate or subeffuse, thin, yellowish, yellowish-grey or olivaceous. Apothecia black, livid-black, or partly dark-reddish or dark-bluish-green; hypothecium pale or yellowish-brown.—Mudd Man. 200; Cromb. Lich. Brit. 77; Leight. Lich. Fl. 270; ed. 3, 269. *L. elæochroma* Tayl. in Mackay, Fl. Hib. ii. 119 (1836). *L. enteroleuca* Ach. Lich. Univ. 177 (1810). *L. parasema* var. *enteroleuca* Nyl. Lich. Scand. 217 (1861) pro parte (corticolous), Mudd Man. 201; Cromb. Lich. Brit. 77. *Lichen parasemus* Sm. Engl. Bot. t. 1450 (1805) pro parte. *Lichenoides leprosum*, &c., Dill. Hist. Musc. l.c. pro parte.

Exsicc. Cromb. n. 181; Leight. nos. 126, 327, 328, 332 (as *L. scabrosa*); Mudd nos. 169, 170; Baxt. Stirp. Crypt. Ox. n. 19; Bohl. n. 45; Johns. n. 345.

Distinguished from the type by the differently coloured thin thallus, which at first sight would almost seem to render it specifically distinct. The apothecia are usually smaller and more numerous than in the species. When the thallus is limited and intersected by the hypothallus in frequent black serpentine lines, it is var. *limitata* Ach. Lich. Univ. 175 (1810) pro parte; Cromb. Lich. Brit. 77 (f. *geographica* Cromb. ms.).

Hab. On trees.—*Distr.* Common throughout the British Isles.—*B. M.* Sark; Tregawn and Withiel, Cornwall; Newton Bushell, Ilsham, Torquay; Ullacombe, near Bovey Tracey, Devon; New Forest, Hants; Saddlescombe, St. Leonard's Forest, and Fairlight, near Hastings, Sussex; Shere, Surrey; Lydd, Kent; Epping Forest, Essex; Oxford; Gopsall Wood and Twycross, Leicestershire; near Bath, Somerset; near Shrewsbury and Oswestry, Shropshire; Malvern, Worcestershire; Barmouth and Dolgelly, Merioneth; Haileywood, Cirencester, Gloucestershire; Abergavenny, Monmouthshire; near Ayton, Cleveland, Yorkshire; Egglestone, Durham; Ashy, Cumberland; Port Soderick, Isle of Man; Balmerino, Fife; Baldovan Woods, Forfarshire; Glen Lochay, Killin, Perthshire (var. *limitata*); Banchory, Morone, Braemar, and Countesswells, Aberdeenshire; Appin and near Inverary, Argyll; Applecross, Ross-shire; Glencar, Kerry; near Cork; Doughruagh Mt., Connemara, Galway.

86. *L. latypea* Ach. Meth. Suppl. 10 (1803).—Thallus effuse, thickish, unequal, granular-areolate, whitish or greyish-white (K + yellow, CaCl + orange-red); hypothallus mostly obsolete. Apothecia small or sometimes rather large, black, plane with a thin margin, becoming convex and immarginate; hypothecium thick, brownish or yellowish-brown; paraphyses sub-coherent,

dark-bluish-green or almost black at the tips; spores ellipsoid, 10–18 μ long, 5–9 μ thick.—*L. scabrosa* Tayl. in Mackay Fl. Hib. ii. 122 (1836) (non Ach.), *fide* Carroll in Journ. Bot. iv. 24 (1866). *L. parasema* var. *latypea* Nyl. Lich. Scand. 217 (1861); Cromb. Lich. Brit. 77; Leight. Lich. Fl. 269; ed. 3, 270 (incl. var. *monticola*). *L. conioips* Mudd Man. 201 (1861), (non Wahlenb.). *L. continuior* Nyl. in Flora lx. 463 (excl. var.) (1877); Leight. Lich. Fl. ed. 3, 277.

Exsicc. Larb. Hb. n. 103.

Differs from *L. parasema* in habitat, in the thicker granular thallus, which is either conglomerate or broken up and scattered, and in the somewhat darker hypothecium. The apothecia are plane and scattered or sometimes subconfluent with the margin evanescent. I have not seen specimens of *L. continuior*; Nylander says it differs only in the rather flat rimose-areolate thallus and the more rapid reaction with hypochlorite of lime.

Hab. On granitic and schistose rocks in maritime and upland districts.—*Distr.* Somewhat general throughout Great Britain.—*B. M.* Islands of Alderney and Sark; Hommet Basnet and Vale Castle, Guernsey; Mount Orgueil Castle, Jersey; Bole Head, and near Plymouth, Devon; Gerrans, and near Penzance, Cornwall; Beeleigh, near Maldon and Ulting, Essex; Langbaughrigg, and near Ayton, Cleveland, Yorkshire; Aberdovey, Merioneth; Isle of Man; Barcaldine, Argyll; Nigg and Portlethen, Kincardineshire; Sybil Head, Kerry; Dawros Cliffs, near Kylemore, and near Letterfrack, Connemara, Galway; Lambay Island, Dublin; Borris, Carlow; Clare Island, Mayo.

Form *latypiza* A. L. Sm.—Thallus subcinereous, effuse (K + yellow, CaCl —).—*L. parasema* subsp. *latypiza* Nyl. in Bull. Soc. Linn. Norm. sér. 2, vi. 310 (1872); var. *latypea* f. *latypiza* Leight. Lich. Fl. ed. 3, 270 (1879).

Differs from the type in the colour reaction and in the somewhat greyer more effuse thallus.

Hab. On rocks.—*B. M.* Twelve Pins, Connemara, Galway (the only British locality).

87. *L. protrusa* Schær. Spicil. 201 (1833) (non Fries).—Thallus effuse pale sulphur-coloured, thickish, granular-verrucose, the granules contiguous and areolate or scattered, sometimes sorediate (K + yellow, CaCl + orange-red). Apothecia black, numerous, often confluent, innate-sessile, plane then convex, the thin smooth entire margin eventually obliterated; hypothecium reddish-brown; paraphyses loosely coherent, blackish-green at the tips; spores oblong-ellipsoid, 11–20 μ long, 7–8 μ thick; hymenial gelatine blue with iodine.—Mudd Man. 207; Leight. Lich. Fl. 271; ed. 3, 270. *L. scabra* Tayl. in Mackay Fl. Hib. ii. 121 (1836). *L. enterochlora* Tayl. ex Leight. Lich. Fl. 271; ed. 3, 271.

Exsicc. Leight. n. 299; Larb. Lich. Hb. n. 67; Johns. n. 378.

Hab. On rocks and stones in maritime and upland districts.—*Distr.* Rather frequent in England and Wales, rare in the Channel Islands, Scotland and S.W. Ireland.—*B. M.* Trinity, Jersey; near Penzance, Cornwall; Whitesand Bay, East Lyn and Torquay, Devon; Sussex; Boro' Green, Kent; Ilminster, Somerset; near Oxford; Malvern, Worcestershire; Barmouth, and Aberdovey, Merioneth; Pwllheli, Carnarvonshire; Ayton and Langbaughrigg, Cleveland, Yorkshire; Peel, Isle of Man; Staveley, Kendal, Westmorland; St. Bees and near Lazonby, Cumberland; near Annan, Dumfriesshire; near Nigg, Kincardineshire; Derriquin, Kerry; Ballinakill and Cloghan, Connemara, Galway; Cliffs of Moher, Clare; Clare Island, Mayo.

Form *meiococca* A. L. Sm.—Thallus similar to the type. Apothecia paler, somewhat reddish-brown; paraphyses distinct, colourless at the tips.—*Lecidea meiococca* Leight. Lich. Fl. ed. 3, 277 (1879). *L. scabra* f. *meiococca* Nyl. in Flora lix. 578 (1876).

Exsicc. Larb. Lich. Hb., without number.

Hab. On maritime rocks.—*Distr.* Rare in N.E. Scotland and N.W. Ireland.—*B. M.* Nigg, Kincardineshire; Lettermore and Ballinakill Bay, Connemara, Galway.

Var. *subviridans* A. L. Sm.—Thallus sulphur-yellow, thin, sometimes scattered, sorediate.—*L. continuior* var. *subviridans* Nyl. in Flora lx. 463 (1877); Cromb. in Grevillea vi. 13; Leight. Lich. Fl. ed. 3, 278.

Exsicc. Johns. 347, 348.

Nylander described the variety on specimens sent by Larbalestier; the two specimens in the British Museum differ from *L. protrusa* only in the more brightly coloured and more sorediate thallus.

Hab. On walls and rocks.—*B. M.* St. Bees, Cumberland; Lough Feagh, Connemara, Galway.

88. *L. goniophila* Schær. Enum. 127 (1850) pro parte.—Thallus effuse, thin, granulose-rimulose, greyish or brownish (K + yellow, sometimes K —, CaCl —). Apothecia black, small, numerous, crowded or scattered, sessile, plane, with a thin margin, becoming convex and immarginate; hypothecium colourless or yellowish; paraphyses loosely coherent, greenish-black or brown at the tips, the green colour sometimes permeating downwards; spores ellipsoid, 12–16 μ long, 6–8 μ thick; hymenial gelatine blue then sordid-wine-red with iodine; spermatia straight, 11–15 μ long, 5–6 μ thick (*vide* Nyl. Lich. Env. Paris, 90 (1896)).—Mudd Man. 202; Cromb. Lich. Brit. 78 (under *L. parasema*). *L. immersa* var. *goniophila* Floerke in Berl. Mag. iii. 311 (1809). *L. pungens* Leight. Lich. Fl. ed. 3, 251 (1879) (cf. Nyl. in Flora lixiv. 188 (1881)). *L. parasema* var. *enteroleuca* Nyl. Lich. Scand. 217 (1861) pro parte. *L. enteroleuca* Leight. Lich. Fl. 265 (1871); ed. 3, 263 (non Ach.). *Biatora pungens* Koerb. Parerg. Lich. 161 (1865).

Exsicc. Mudd n. 172; Leight. n. 330; Johns. n. 150 in Brit. Mus. specimen (errore *Lecanora epulotica*), 443.

Differs from *L. latypha* in the reaction with CaCl, in the much thinner, more furfuraceous thallus, and in the usually almost colourless hypothecium. Acharius' species *L. enteroleuca* (Lich. Univ. 177 (1810)) grows on trees and is included under *L. parasema* var. *elurochroma*. Nylander has drawn a distinction between *L. goniophila* and *L. enteroleuca* in that the spermatia of the former are straight, while those of *L. enteroleuca* are arcuate $20-30 \mu \times 1 \mu$. (See Lich. Env. Paris, 90 (1896)).

Hab. On rocks mostly siliceous and on stones.—*Distr.* Frequent in all parts of the British Isles.—*B. M.* St. Lawrence, Isle of Wight; Ardingly Rocks, St. Leonard's Forest, Sussex; Ulting, Essex; Limpley Stoke, Wilts; Cirencester, Gloucestershire; Llandyssil, Cardiganshire; Knighton, Radnorshire; near Oswestry and Tong Priory, Shropshire; Barmouth and Dolgelly, Merioneth; Capel Curig, Carnarvonshire; Shawswell, Gloucestershire; Ayton, Cleveland Dent, and near Battersby, Yorkshire; Mallerstrang, Staveley and near Plumgarths, Westmorland; Barnard Castle, Teesdale, Durham; near Berwick; Lamplugh, Cockermouth, Cumberland; Glen Tilt, Craig Calliach and Craig Tulloch, Blair Athole, Perthshire; Barcaldine, Argyll; near Kylemore, Connemara and Lough Cooter, Galway; Clare Island, Mayo.

Var. *acervata* Mudd Man. 202 (1861).—Thallus effuse, greyish-white, granular, the granules becoming more or less pulverulent and greenish-yellow. Apothecia small, aggregated into clusters of 4 to 20, at first plane and marginate, becoming convex and immarginate; paraphyses lax, black at the tips.

Exsicc. Mudd n. 173.

Hab. On rocks and stones in mountainous districts.—*B. M.* Frequent at Highcliff, Cleveland, Yorkshire (the only locality).

89. *L. inserena* Nyl. in Flora, lii. 84 (1869).—Thallus thickish, cinereous, glaucous grey, rimose-areolate or areolate-granulose, the areolæ plane, often occurring as scattered granules on a black hypothallus. Apothecia black, plane or slightly convex; hypothecium colourless, with an opaque white stratum in the lower portion; paraphyses indistinct, bluish-black at the tips; spores ellipsoid, oblong, $14-17 \mu$ long, $6-8 \mu$ thick; hymenial gelatine sordid-blue, the asci becoming violet-coloured with iodine.—(Cromb. in Journ. Linn. Soc. (Bot.) xv. 487 (1871) & Lich. Brit. 85; Leight. Lich. Fl. 278; ed. 3, 280.

Resembling somewhat tumid forms of *L. griseoatra*, but well distinguished by the colourless hypothecium.

Hab. On granite rocks. *Distr.* Very rare on the Grampians, Scotland.—*B. M.* Ben Lawers, Perthshire; Craig Guie and Morrone, Braemar, Aberdeenshire.

90. *L. viridans* Leight. Lich. Fl. ed. 3, 271 (1879).—Thallus effuse, thin, minutely granulose, yellowish-green or sordid-greenish (Kf + yellowish, CaCl — K(CaCl) + orange-red); hypothallus evanescent. Apothecia small, innate-sessile, at first plane, and thickly margined, at length convex and submarginate,

black, sometimes greenish-suffused; hypothecium yellowish; paraphyses subdiscrete, dark-greenish above; spores ellipsoid-oblong, small, 9–12 μ long, 6–8 μ thick; hymenial gelatine bluish with iodine.—*L. sabuletorum* var. *viridans* Flot. in Flora xi. 697 (1828). *Lecidella viridans* Koerb. Syst. Lich. Germ. 242 (1855).

Exsicc. Leight. n. 331; Larb. Lich. Hb. n. 307.

Flotow points out that the apothecia, when moistened, appear paler and transparent (owing to the pale hypothecium), surrounded by a dark ring.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, Wales and central England.—*B. M.* Between Rozel and Boulay Bay, Jersey; Lyth Hill, Shropshire.

91. *L. leucophæa* Nyl. in Flora liii. 35 (1870).—Thallus indeterminate, thinnish, verrucose-areolate, the areolæ more or less convex, greyish (K — or yellowish, CaCl —); hypothallus black. Apothecia small, adnate or appressed, plane and thinly margined, reddish-brown, dark-purplish or livid-black, within whitish, the margin often paler, at length excluded; hypothecium pale; paraphyses brown or dark-brown at the apices; spores ellipsoid, 9–14 μ long, 4–8 μ thick; hymenial gelatine pale-bluish, the asci tawny-wine-coloured, with iodine.—*Lecanora leucophæa* Cromb. Lich. Brit. 51 (1870); Leight. Lich. Fl. 194; ed. 3, 178 (incl. var. *conglobata*); var. *conglobata* Cromb. in Journ. Bot. xi. 134 (1873). *Biatora leucophæa* Floerke ex Koerb. Syst. Lich. Germ. 194 (1855). *Lecanora leucophæiza* Nyl. in Flora lvii. 308 (1874); Leight. Lich. Fl. ed. 3, 178.

Exsicc. Cromb. n. 63.

Nylander l.c. has stated that *Lecanora leucophæiza* differs from *Lecidea leucophæa* in the reaction with iodine; in the former the asci alone being affected by the stain, and also in the thallus becoming slightly yellow with K.

Sometimes the thallus is more massive and scattered, with the apothecia convex, difform and tuberculate; it is then var. *conglobata* Cromb. The apothecia are occasionally crowded together.

Hab. On subalpine rocks.—*Distr.* Plentiful where it occurs in the hilly districts of Wales, N. England, Scotland and W. Ireland.—*B. M.* Cader Idris, near Llyn Aran, Dolgelly, Barmouth and Aran Mawddwy, Merioneth; Snowdon and Carnedd Dafydd, Carnarvonshire; Blakeney, Norfolk; High Force, Teesdale and Ayton, Cleveland, Yorkshire; Red Screes, Crow Fell and Black Lot, Westmorland; Portlethen, Kincardineshire; Craig Tulloch, Blair Athole, Ben Lawers, near Loch Voil and Ben-y-gloe, Perthshire; Achosragan Hill, Appin, Argyll; Morrone and Craig Guie, Braemar, Aberdeenshire; near Kylemore and near Lough Mask, Connemara, Galway.

92. *L. leucophæoides* Nyl. in Flora liii. 35 (1870).—Thallus areolate-granulose, the areolæ smooth, plane or somewhat rounded, greyish-white (K + yellow, then orange-red); hypothallus black, at times limiting the thallus. Apothecia black, or brownish-black, somewhat plane, becoming immarginate; hypothecium

colourless; paraphyses discrete, slender, the epithecium umber-brown; spores ellipsoid or oblong, 10–17 μ long; 4–6 μ thick; hymenial gelatine and asci bluish with iodine. The spermatia are arcuate as in *L. leucophæa*.

Closely allied to the preceding, but differs in the subdeterminate thallus, the more crowded areolæ, the less prominent hypothallus, and in the thalline reaction.

Hab. On rocks in upland districts.—*B. M.* Dolgelly, Merioneth.

93. *L. discolorella* Nyl. in Flora lx. 459 (1877).—Thallus effuse, thin, whitish, areolate-rimose or scattered (K + yellow, K (CaCl) + red); hypothallus black. Apothecia black, adnate or appressed, plane, becoming slightly convex and immarginate; hypothecium pale; paraphyses discrete, reddish-brown at the apices; spores ellipsoid, 12–16 μ long, 6–7 μ thick.—Cromb. in Grevillea vii. 111. *Lecanora discolorella* Leight. Lich. Fl.; ed. 3, 176 (1879).

Somewhat similar to *L. leucophæa*, but the thallus is thin and scanty and light in colour, and the thalline reaction is different. The apothecia are at first sight like those of some species of *Lecanora*, owing to the closely surrounding whitish thallus. The spermatia are arcuate, about 20 μ long and excessively slender.

Hab. On rocks.—*B. M.* Near Penzance, Cornwall (the only locality).

94. *L. viridiatra* Schær. Enum. 108 (1850).—Thallus greenish or dull-yellow, indeterminate, thickish, areolate, the areolæ plane or convex, subcontiguous or scattered (Kf + yellowish, CaCl —, medulla I —); hypothallus black, distinct. Apothecia small, appressed, plane and thinly margined, at length somewhat convex and immarginate, blackish; hypothecium colourless; paraphyses coherent, dark-bluish-brown or olivaceous at the apices; spores ellipsoid, 11–15 μ long, 5–7 μ thick; hymenial gelatine bluish then sordid, the asci wine-reddish, with iodine.—*L. luteoatra* Nyl. in Flora lvi. 299 (1873); Cromb. in Journ. Bot. xiii. 141 (1875); Leight. Lich. Fl.; ed. 3, 293. *Biatora viridiatra* Stenh. Sched. Crit. xiv. 8 (1833).

From its general appearance might readily be taken for a *Lecanora* allied to *L. polytrapa*. In our specimens the areolæ are rather scattered, with the hypothallus very visible between them. The apothecia, sparingly present in these, are at times 1–2 innate in each areola.

Hab. On quartzose boulders in a mountainous region.—*B. M.* Morrone, Braemar, Aberdeenshire (the only British locality).

95. *L. ænea* Dufour ex Fr. Lich. Europ. 108 (1831); Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 380.—Thallus subdeterminate, thickish, rimulose- or verrucose-areolate, shining, tawny or dusky-brown, the areolæ plane or convex (Kf + yellowish, CaCl —, medulla I —); hypothallus black. Apothecia moderate

or somewhat large, adnate, at first plane and thinly margined, at length convex and immarginate, brownish-black or black; hypothecium colourless; paraphyses concrete, somewhat fuliginous at the apices; spores oblong-ellipsoid, 15–18 μ long, 5–7 μ thick; hymenial gelatine bluish then sordid with iodine.—Cromb. in Journ. Bot. xi. 135 (1873); Leight. Lich. Fl. ed. 3, 297.

The species has been found in mountainous regions of Southern and Northern Europe. The apothecia in the British Museum specimen have a dense white layer immediately beneath the hymenium and lower down a dark-brown hypothecium which is absent in the continental specimens. The species is retained here but the plants from Braemar might rather be included under *L. fuscoatra*. The spermatia in *L. ænea* are long, acicular and arcuate (*vide* Th. Fr. Lich. Scand. 457).

Hab. On a mica-schist boulder in a mountainous region.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

96. *L. nigroglomerata* Leight. Lich. Fl. 252 (1871).—Thallus effuse, subareolate, minutely squamulose, the squamules smooth and shining, crenulate, glaucous-white, very small, and crowded round the groups of apothecia (K + yellow, CaCl + yellow), hypothallus black, little visible. Apothecia black, moderate in size, crowded and deformed, shining, plane or convex, with a thickish slightly paler margin; hypothecium colourless, lateral walls thin, dusky-blackish, often continuous under the hypothecium as a thin dusky line; paraphyses coherent, greenish-black at the apices; spores ellipsoid, 11–15 μ long, 6–8 μ thick; hymenial gelatine bluish then sordid-yellow with iodine.—Cromb. in Journ. Bot. ix. 179 (1871). *Lecanora nigroglomerata* Leight. Lich. Fl. ed. 3, 179 (1879).

Exsicc. Cromb. n. 64.

Externally this species has a general resemblance to *L. auriculata* var. *diducens*, but is sufficiently distinguished by the subsquamulose dispersed thallus and the colourless hypothecium.

Hab. On quartzose stones in bare alpine places.—*B. M.* Summit of Cairn Gowar, Ben-y-gloe, Blair Athole, Perthshire (the only locality).

97. *L. scotinodes* Nyl. in Flora lvi. 295 (1873).—Thallus subdeterminate, thinnish, unequal, areolate-rimose, dark-greyish. Apothecia small, convex, immarginate, black, hypothecium colourless; paraphyses moderate, dark-blue at the incrassate apices; epithecium K + pale-violet; spores oblong, simple or occasionally 1-septate, 14–18 μ long, 5–6 μ thick; hymenial gelatine bluish then tawny-wine-coloured or reddish with iodine.—Cromb. in Grevillea ii. 90; Leight. Lich. Fl. ed. 332.

Allied to *L. scotina*, a plant of Bavaria, but differs in the esquamulose thallus, the convex apothecia, the larger spores and other characters given. The numerous apothecia are occasionally somewhat crowded.

Hab. On schistose rocks in subalpine tracts.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

98. *L. assimilis* Th. Fr. Lich. Scand. 556 (1874).—Thallus rather thin, areolate-warted or conglomerate, brownish-fawn-coloured or sordid, sometimes evanescent (K —, CaCl —). Apothecia minute, black, sessile or adnate, at first concave with a prominent margin, becoming plane or slightly convex; hypothecium colourless; paraphyses slender, involved in gelatine, towards the tips a clear greenish-blue colour; spores ellipsoid with a thin epispore, 11–13 μ long, 5–7 μ thick; hymenial gelatine deep-blue with iodine.

In our specimens the spores are rather smaller than the size given by Th. Fr., measuring about 8 $\mu \times 4 \mu$. The beautiful blue colour of the epithecium is well marked. The same colouring of the paraphyses occurs in *L. alienata* from W. Ireland. In a specimen from Ireland (M. C. Knowles) the apothecia are typical, but the thallus has almost disappeared.

Hab. On rocks.—*Distr.* Rare in the S. Grampians and in N. Ireland. *B. M.* Ben Lawers, Perthshire; Ernyvale, Monaghan.

99. *L. arctica* Sommerf. Suppl. Fl. Lapp. 156 (1826).—Thallus effuse, composed of minute, subglobose, papillose granules, crowded or subdiscrete, whitish or brownish-grey (Kf + yellow, medulla, CaCl + orange-red). Apothecia small, black, bluish-pruinose or naked, convex, immarginate; hypothecium pale-brownish; paraphyses indistinct, sordid-greenish-black towards the apices; spores oblong or ellipsoid, 13–18 μ long, 6–8 μ thick; hymenial gelatine slightly blue with iodine.—Mudd Man. 200; Cromb. Lich. Brit. 79; Leight. Lich. Fl. 273; ed. 3, 274.

A high alpine species with an entirely northern distribution.

Hab. On mosses in alpine districts.—*Distr.* On the high altitudes of the Scottish Grampians.—*B. M.* Ben Lawers, Ben Vrackie and Craig Calliach, Killin, Perthshire; Ben Nevis, Inverness-shire; Ben Macdhui and Lochnagar, Braemar, Aberdeenshire.

100. *L. limosa* Ach. Lich. Univ. 182 (1810).—Thallus effuse, thin, furfuraceous, whitish-grey (K —, CaCl —). Apothecia black, adnate, convex or subglobose, immarginate; hypothecium colourless or pale-brownish; paraphyses thickish, coherent, usually bluish-green at the apices; spores ellipsoid, fusiform-ellipsoid or oblong, 9–18 μ long, 4–6 μ thick; hymenial gelatine blue then sordid-wine-red or yellowish with iodine.—Carroll in Journ. Bot. iv. 24 (1866); Cromb. Lich. Brit. 79; Leight. Lich. Fl. 258; ed. 3, 252. *L. Wulfenii* Mudd Man. 200 pro parte (non Hepp *fide* Carroll).

Exsicc. Cromb. Lich. Brit. 90.

This species is nearly allied to the next, but the thallus is less granular and the spores are shorter.

Hab. On the earth in mountainous districts.—*Distr.* Local and rare on the higher Scottish hills.—*B. M.* Canlochan, Forfarshire; Ben Lawers and Ben-y-gloe, Blair Athole, Perthshire; Ben Cruachan, Argyll; Ben-naboord and Lochnagar, Braemar, Aberdeenshire.

101. *L. alpestris* Sommerf. in K. Norske Vidensk. Skrift. ii. 54 (1824-7).—Thallus effuse, thin, granular or minutely warted-areolate, whitish or greyish on a whitish hypothallus (Kf + yellow, CaCl —). Apothecia appressed, convex, immarginate, subconglomerate, black; hypothecium colourless or pale-brownish; paraphyses coherent, dark brownish-blue-green at the apices; spores elongate-ellipsoid or oblong, 14–25 μ long, 3–4 μ thick; hymenial gelatine blue then tawny-yellowish with iodine.—Carroll in Journ. Bot. iv. 24 (1866); Cromb. Lich. Brit. 79; Leight. Lich. Fl. ed. 3, 272.

Has been confused with the continental species *L. Wulfenii*, which has a whitish tartareous thallus and spreads over mosses in alpine situations.

Hab. On the earth in alpine places.—*Distr.* Rare, found only on the summits of the highest hills in Scotland.—*B. M.* Ben Lawers, Perthshire.

102. *L. aniptiza* Stirton in Trans. Glasg. Soc. Field Nat. 1879, 85.—Thallus dark-brownish- or greenish-grey, granular, thin. Apothecia black, small, prominent, convex, immarginate, papillose (as if glomerate); hypothecium colourless, the hymenium brownish; paraphyses irregular, indistinct, slender and branching, the epithecium dark brown; hymenium and epithecium K + dull violet; spores oblong-cylindrical, small, 7–11 μ long, 2.5–3 μ thick; hymenial gelatine bright-blue with iodine.—Leight. Lich. Fl. ed. 3, 277.

Specimen from Hb. Stirton examined. The species more truly belongs to Sect. *Biatora* near to *L. perobscura*; it differs from that species in the uneven apothecia and in the reaction with potash.

Hab. On decorticated wood.—*B. M.* Near Killiecrankie, Perthshire.

103. *L. tessellata* Floerk. Deutschl. Lich. 4, 5 (1819).—Thallus whitish or greyish, tartareous, areolate, the areolae plane or convex (K —). Apothecia scattered crowded, sessile, adnate, black, slightly pruinose, plane or subconvex with a thin flexuose margin; hypothecium colourless, then rather sordid; paraphyses loosely coherent, slightly thickened and brownish-black at the apices (NO₃ + rose-coloured); spores ellipsoid, small, 9–12 μ long, 4–6 μ thick; hymenial gelatine blue then sordid, the asci violet-red, with iodine.—Salw. in Trans. Bot. Soc. Edinb. vii. 553 (1863); Carroll in Journ. Bot. iv. 24 (1866); Cromb. Lich. Brit. 82 (excl. f. *ochracea*); Leight. Lich. Fl. 276; ed. 3, 279. *L. lapicida* var. *cyanea* Ach. Meth. 38 (1803). *L. spilota* Fr. Syst. Orb. Veg. 286 (1825); Leight. Lich. Fl. 277 (excl. f. *ochracea*); ed. 3, 279. *L. pantosticta* var. *spilota* Ach. Lich. Univ. 154. (1810)?

The plant recorded by Salwey was collected by him on rocks at Jerbourg, Guernsey, and was determined by Nylander. The species has a very wide European distribution.

Hab. On rocks, mostly alpine. *Distr.* Rare in the British Isles.—*B. M.* Ben Lawers, Perthshire; Glen Callater, Braemar, Aberdeenshire.

104. *L. prominula* Borr. in Engl. Bot. Suppl. 2687, fig. 1a (1831).—Thallus pale tawny-brown, thin, minutely granular (K + yellow, CaCl + yellow). Apothecia black, small, numerous, crowded, sessile, plane, with an obtuse entire margin; hypothecium colourless or yellowish-brown, the lateral excipulum blackish-brown; paraphyses rather lax, pale, dark-brown at the apices; spores oblong-ellipsoid, 11–15 μ long, 6–9 μ thick; hymenial gelatine blue then dirty-violet with iodine.—Hook. in Sm. Engl. Fl. v. 175; Tayl. in Mackay Fl. Hib. ii. 119; Leight. Lich. Fl. 259; ed. 3, 255.

Scarcely to be distinguished outwardly from *L. crustulata*, but differing in the lighter-coloured hypothecium, and the colour reaction of the thallus, which, however, is not constant.

Hab. On calcareous rocks and flints.—*Distr.* Not common in S. and Central England.—*B. M.* Shanklin, Isle of Wight; Matlock, Derbyshire; Westmorland.

105. *L. instratula* Nyl. in Flora lxi. 242 (1878).—Thallus dark-grey, thin, smooth, plane, minutely cracked-areolate, with a black hypothallus. Apothecia minute, black, innate and immarginate; hypothecium colourless; paraphyses distinct but very coherent, the epithecium blackish-green; asci ventriform; spores ellipsoid, 8–11 μ long, 4–5 μ thick.—B. de Lesd. in Bull. Soc. Bot. Fr. liv. 444, 1907; Lillie in Scott. Bot. Rev. i. 152 (1912); A.L.Sm. Monogr. Lich. i. 470 (1918). Specimen not seen.

The description is taken from Nylander and from B. de Lesdain. Nylander describes the apothecium as "dark within" and places it near to *L. fuscoatra*. B. de Lesdain gives the internal characters as above, which indicate affinity with *L. lapicida*.

Hab. On granite rocks. Collected by D. Lillie at Camster Cairns, Caithness.

106. *L. marginata* Schaer. Enum. 115 (1850).—Thallus tartareous, light-grey or -yellowish or -brown, thickish, cracked-areolate, determinate, with a black hypothallus (K + yellow). Apothecia black, sessile, plane or tumid with a prominent flexuose margin, at length immarginate; hypothecium pale; paraphyses coherent, dark olive-green at the tips; spores ellipsoid, 10–15 μ long, 5–7 μ thick; hymenial gelatine blue with iodine.—Cromb. Lich. Brit. 83; Leight. Lich. Fl. 284; ed. 3, 289.

Hab. On alpine rocks, rare. Collected on Ben Lawers by Admiral Jones (1868).

107. *L. lapicida* Ach. Meth. 37 (1803) pro parte.—Thallus tartareous, thin, cracked-areolate, the areolæ plane, light- or ash-grey (K — or + y, then red; medulla I + blue). Apothecia appressed or adnate, plane or slightly concave with a thin prominent margin; hypothecium pale or brownish; paraphyses loosely coherent, blue-greenish-black or dark-brown at the apices; spores ellipsoid, 9–13 μ long, 4–6 μ thick; hymenial gelatine blue then sordid with iodine.—Mudd Man. 209 pro parte; Cromb. Lich. Brit. 81 pro parte (excl. vars.); Leight. Lich. Fl. 284 (excl. vars.); ed. 3, 289 (excl. var.). *L. polycarpa* Floerke ex Sommerf. Suppl. Fl. Lapp. 149 (1826); Cromb. Lich. Brit. 82; Leight. Lich. Fl. 283; ed. 3, 288. *Lichen lapicida* Ach. Lich. Suec. Prodr. 61 (1798).

Exsicc. Johns. n. 350.

Th. Fries (Lich. Scand. 491, 493) places *L. polycarpa* under *L. pantherina*, of which he regards *L. lapicida* as a subspecies. The only difference between the two is in the reaction with potash: in *L. polycarpa* the reaction varies from yellow to yellow followed by red, while in *L. lapicida* there is usually no colour-reaction. Fries further states that some specimens of *lapicida* give no reaction in one part of the thallus, while in another they tinge red. The reaction of our specimens varies from a faint yellow to crimson.

Hab. On granitic and schistose rocks.—*Distr.* Found chiefly in mountainous regions.—*B. M.* Cader Idris, Merioneth; Llyn Geirionydd, Trefriw; Nant Francon and Llanberis, Carnarvonshire; Malvern Hills, Worcestershire; Red Screes, Reston Scar, and Pugh Crag, Westmorland; Dent Hill, Cumberland; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; coast of Kincardineshire; Glen Nevis, Inverness-shire; Clare Island, Mayo.

Var *declinans* Nyl. Lich. Scand. 226 (1861).—Similar to the type but with a darker hypothecium and nearly ecrustaceous thallus (K + yellow, then red).—Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. 403 (1867); Cromb. Lich. Brit. 81. *L. polycarpa* var. *declinans* Leight. Lich. Fl. 284 (1871); ed. 3, 289. *L. declinans* Nyl. in Flora lxi. 243 (1878).

Exsicc. Johns. n. 505.

Hab. On rocks in mountainous regions.—*B. M.* Ennerdale, Cumberland; two doubtful specimens without spores from Ben Lawers, Perthshire, and Braemar, Aberdeenshire, collected and named by Carroll.

108. *L. lithophila* Ach. Syn. 14 (1814).—Thallus tartareous, whitish or ashy-grey, thin, cracked-areolate, the areolæ plane (K —, CaCl —); hypothallus black. Apothecia numerous, moderate in size or small, scattered or aggregate and angular, plane, brownish-black, velvety and soft, almost black-pruinose with a thin prominent flexuose margin; hypothecium colourless or pale; paraphyses slender, loosely coherent, sometimes with a greenish tinge, clavate, and blackish-brown at the tips (NO₃ + rose-violet); spores ellipsoid, 9–15 μ long, 5–6 μ thick; hymenial

gelatine deep-blue with iodine.—Salw. in Trans. Bot. Soc. Edinb. vii. 553 (1863); Cromb. Lich. Brit. 82; Leight. Lich. Fl. 285; ed. 3, 290.

Exsicc. Cromb. n. 183; Johns. n. 446.

Spores rarely well developed. Differs from other species in the same group in the black velvety apothecia and the thickened apices of the paraphyses. When the apothecia are very small and the thallus almost evanescent it is f. *minor* Cromb. ms., two specimens of which from Ben Lawers are in the British Museum. Nylander states that the epithecium usually turns reddish when moist. The spermatia are acicular, 12–15 μ long.

Hab. On rocks in upland or mountainous regions.—*Distr.* Somewhat rare in S.W. and N. England, Wales, and W. Ireland, frequent on the Grampians, Scotland.—*B. M.* Luxulion, Cornwall: May Hill, Gloucestershire; Cader Idris, Merioneth; Cwm Llugwy, Carnarvonshire; Bilsdale, Cleveland, Yorkshire; Barnard Castle, Durham; Langdale, and Dan Hill, Westmorland; Lazonby, Cumberland; Ben Lomond, Stirlingshire; Stronachlachan, Killin, Crianlarich, Ben Lawers, Ben Vrackie, Craig Calliaeh, Glen Fender and Craig Tulloch, Blair Athole, Perthshire; Achosragan Hill, Appin, Argyll; Glen Callater and Morrone, Braemar, Aberdeenshire; Applecross, Ross-shire; Killery Bay, Connemara, Galway.

Form *ochracea* Nyl. Lich. Scand. 227 (1861).—Differs from the type in the yellowish or rusty-red colour of the thallus.—*L. daphana* var. *ochracea* Ach. Lich. Univ. 166 (1810). *L. tessellata* f. *ochracea* Cromb. Lich. Brit. 82 (1870). *L. spilota* f. *ochracea* Leight. Lich. Fl. 277 (1871). *L. lapicida* var. *ochracea* Leight. op. cit. ed. 3, 290 (1879). *L. silacea* Ach. Meth. 48 (1803) pro parte; Engl. Bot. t. 1118 (as *Lichen silaceus*); Hook. in Sm. Engl. Fl. 178.

Hab. On rocks.—*Distr.* Somewhat rare in the British Isles.—*B. M.* Alternan, Cornwall; near Llanellwedd, Radnorshire; Beddgelert, Llyn Geirionwydd, Carnarvonshire; Pugh Crag, Westmorland; Alston, Cumberland; Glen Fender and Craig Tulloch, Blair Athole, Perthshire; Achosragan Hill, Appin, Argyll; Morrone, Braemar, Aberdeenshire.

109. *L. plana* Nyl. in Bull. Soc. Linn. Normand. sér. 2, vi. 277 (1872).—Thallus effuse, thinnish, areolate-rimose, greyish- or glaucous-white (K —, CaCl —, medulla I —), often evanescent; hypothallus black. Apothecia small, adnate, plane, thinly margined, usually crowded and angular, black, the margin entire; hypothecium colourless; paraphyses loosely coherent, narrowly clavate and dark-brown or greenish-black at the apices; spores narrowly oblong, 9–12 μ long, 2.5–4 μ thick; hymenial gelatine deep blue with iodine.—Cromb. in Grevillea i. 173; Leight. Lich. Fl. ed. 3, 290. *L. lapicida* subsp. *lithophiloides* Nyl. ex Cromb. Lich. Brit. 81 (1870); var. *lithophiloides* Leight. Lich. Fl. 285. *Lecidella plana* Lahm ex Koerb. Par. Lich. 211 (1861).

Exsicc. Leight. n. 157; Mudd n. 178 (as *L. lapicida*).

Resembles a small condition of the preceding, but is well distinguished by the persistently black apothecia and the narrower spores.

The thallus is somewhat variable, being either continuous, scabrid or smoothish, or more or less scattered; at times granulate-verrucose (form *perfectior* Nyl. in Flora lxiv. 539 (1881), and not unfrequently obsolete. The numerous apothecia are often confluent and then variously angulose or difform, and sometimes grow in lines.

Hab. On rocks and boulders, granitic and schistose, chiefly in mountainous regions.—*Distr.* Found only here and there in Central and N. England, N. Wales and among the Grampians, Scotland.—*B. M.* St. Briavels, Gloucestershire; near Buxton, Derbyshire; Cader Idris, Merionethshire; Guisboro' Moor, Kildale Moor, Ayton Moor and Ingleby, Cleveland, Yorkshire; Langdale and Reston Scar, Westmorland; Alston, Penrith and Lazenby, Cumberland; Canlochan, Forfarshire; Ben Lawers and Stronachlachan, Killin, Perthshire; Benaboard, Braemar, Aberdeenshire.

110. *L. lithophiliza* Nyl. in Flora li. 473 (1868).—Thallus subdeterminate, thickish, firm, unequally flattened, deeply or slightly cracked-areolate, greyish or greyish-white (K f+ yellowish, CaCl —). Apothecia submoderate in size, innate, somewhat plane or convex, immarginate, brownish-black, hypothecium with the middle layer chalky-white, opaque, the lower perithecial layer a thin black line; paraphyses moderate, dull-brownish at the apices; spores oblong, 9–17 μ long, 3·5–4·5 μ thick; hymenial gelatine bluish with iodine.—Cromb. in Journ. Bot. vii. 106 (1869) & Lich. Brit. 66; Leight. Lich. Fl. 286; ed. 3, 292.

Differs from the preceding in the character of the more developed thallus and the innate apothecia. Nylander considered its affinity to be with *L. phæops* in Sect. *Biatora*.

Hab. On schistose rocks and walls, generally in maritime and mountainous regions.—*Distr.* Only sparingly in upland or hilly districts.—*N. M.* Near Taunton, Somerset; Garth, Dolgelly, Merioneth; Hexham, Northumberland; Crianlarch, Ben Lawers and Craig Tulloch, Perthshire; Portlethen, Kincardineshire.

111. *L. mesotropa* Nyl. in Flora l. 328 (1867).—Thallus indeterminate, verrucose-areolate, greyish; the areolæ rather convex (K —, K(CaCl) + reddish). Apothecia small, adnate, somewhat plane, opaque, margined, blackish or brownish-black, the margin obtuse, at length evanescent; paraphyses slender, not well discrete; epithecium brownish; hypothecium colourless; spores ellipsoid, colourless, 9–13 μ long, 5–6 μ thick; hymenial gelatine bluish with iodine.—Carroll in Journ. Bot. v. 257 (1867); Cromb. *op. cit.* vii. 49 (1869) & Lich. Brit. 81; Leight. Lich. Fl. 277; ed. 3, 280.

Intermediate between *L. lapicida* and *L. lithophila*, the thallus much resembling the former and the apothecia those of the latter species. The apothecia have often a biatorine aspect.

Hab. On a gneissic boulder in an upland mountainous region.—*B. M.* Near Loch Ard, Perthshire (the only locality).

112. *L. mesotropoides* Nyl. in Flora lv. 359 (1872).—Thallus subdeterminate, moderate, verrucose-areolate, greyish, the areolæ convex (K + yellowish, CaCl —, medulla 1 —). Apothecia small, prominent, blackish, at first plane and thinly margined, then convex and immarginate; paraphyses slender, more or less coherent; hypothecium colourless; spores ellipsoid, 9–11 μ long, 6–7 μ thick; hymenial gelatine bluish with iodine.—Cromb. in Grevillea i. 69; Leight. Lich. Fl. ed. 3, 282.

Distinguished from *L. mesotropa* by the thalline reactions, the thinner apothecia and the shorter spores. The two British specimens are well fertile. The spermogones, here and there visible, have the spermatia 7–10 μ long, scarcely 1 μ thick.

Hab. On calcareous and schistose stones of a wall in an upland situation.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

113. *L. mesotropiza* Nyl. in Flora lvi. 20 (1873).—Thallus indeterminate, moderate, verrucose-rugulose, whitish (K + deep yellow, CaCl —). Apothecia small or submoderate, more or less crowded, adnate, black, at first plane and thinly margined, at length convex, immarginate, sometimes slightly pruinose, bluish-grey within; paraphyses not very discrete; epithecium dark-greenish-blue; hypothecium colourless; spores ellipsoid, 11–12 μ long, 7 μ thick; hymenial gelatine bluish, the asci violet, with iodine.—Cromb. in Grevillea i. 142; Leight. Lich. Fl. ed. 3, 275.

Externally very similar to the preceding, from which it differs chiefly in the whitish verrucose thallus and the bluish epithecium.

Hab. On schistose stones of a wall in an upland district.—*B. M.* Hill of Ardo, near Aberdeen (the only locality).

114. *L. aggregatula* Nyl. in Flora lxvi. 101 (1883).—Thallus thickish, indeterminate, minutely granulate, the granules aggregate, grouped in areolæ, whitish or greyish-white (K —, CaCl —). Apothecia small, adnate, plane, subrugulose, at times more or less congregate, blackish or brownish-black; hypothecium colourless; paraphyses slender, somewhat clavate and brown at the apices; spores oblong, 11–15 μ long, 5–6 μ thick; hymenial gelatine bluish, then tawny wine-coloured with iodine.—Cromb. in Grevillea xii. 90.

Exsicc. Larb. Lich. Hb. n. 338 (as *Lecanora aggregatula*).

Considered by Nylander as allied to *L. leucophæa*. The thallus is overrun by a blue-green alga. The spermogones have the spermatia arcuate, 14–18 μ long, 5 μ thick.

Hab. On rocks.—*B. M.* Charnwood Forest, Leicestershire.

115. *L. subkochiana* Cromb. in Journ. Bot. ix. 179 (1871).—Thallus crustaceous, smooth, whitish or greyish, determinate, cracked-areolate, the areolæ plane, contiguous (K + yellowish, then red, CaCl —). Apothecia black, numerous, innate or sessile

with a prominent margin; hypothecium colourless or pale-brownish; paraphyses dark at the tips; spores ellipsoid, small, 8–12 μ long, 5–6 μ thick; hymenial gelatine blue with iodine.—Leight. Lich. Fl. ed. 3, 295. *L. tessellata* f. *subkochiana* Nyl. in Flora lii. 85 (1869).

Strongly resembles *L. lactea*, of which it might almost be considered a growth form. It differs in the lighter hypothecium and somewhat smaller spores.

Hab. On schistose rocks in maritime and subalpine regions.—*Distr.* Rare in Wales and N.E. Scotland.—*B. M.* Barmouth, Merioneth; Llyn Geirionydd and Trefriw, Carnarvonshire; coast of Kincardineshire.

116. *L. pilati* Koerb. Parerg. Lich. 223 (1861).—Thallus thin, whitish, unequally verrucose (Kf + y) or almost obsolete. Apothecia sessile, varying in size up to 1.5 mm. wide, black, at first plane, becoming rather difform, variously convex and immarginate, scattered or aggregate, the excipulum containing parietin (K + crimson or reddish); hypothecium pallid; paraphyses concrete, brownish- or bluish-black at the tips, the colour penetrating downwards; spores small, 6–9 μ long, 3–4 μ thick; hymenial gelatine bluish or wine-red with iodine.—*L. phylliscina* Nyl. in Flora lvi. 21 (1873; Cromb. in Journ. Bot. xiii. 141 (1875); A. L. Sm. Monogr. Brit. Lich. ii. 80 (1911). *L. phyllodisca* Stirt. in Glasg. Soc. Field. Nat. 86 (1873).

Distinguished from other *Lecideæ* by the presence of parietin beneath the apothecium. As suggested by Th. Fr. (Lich. Scand. 499) there seems no reason to doubt that *L. pilati* and *L. phylliscina* are identical, though our specimens listed under the latter are old or are poorly developed and without spores. Two specimens from Perthshire give the same red reaction with potash as does *L. phylliscina* from Morrone, and in these three the hypothecium is darker. Stirton's specimen of *L. phyllodisca* from Kinloch Rannoch is entirely typical of *L. pilati*.

Hab. On rocks in mountainous regions.—*Distr.* Reported only from the Highlands of Scotland.—*B. M.* Killiecrankie, Kinloch Rannoch, Ben Vrackie and near to Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire.

117. *L. rivulosa* Ach. Meth. 38 (1803); Nyl. Lich. Scand. 222.—Thallus determinate, areolate-rimose or granulate-areolate, mouse-coloured, greyish-brown or pale-greyish (K —, CaCl —); hypothallus blackish, limiting and intersecting the thallus. Apothecia sessile, or adnate, somewhat plane, margined, slightly scabrid, brownish-black or black, the margin thin, flexuose, paler, hypothecium pale; paraphyses discrete, brown at the apices (NO₃ + violet), spores ellipsoid or ellipsoid-oblong, slightly curved (bean or kidney-shaped), becoming brown by degeneration, 9–12 μ long, 4–6 μ thick; hymenial gelatine pale-bluish, the apices of the asci deep-blue then wine-red with iodine.—S. F. Gray Nat. Arr. i. 467; Hook, in Sm. Engl. Fl. v. 179; Tayl. in Mackay

Fl. Hib. ii. 125; Mudd Man. 199 (excl. var.); Cromb. Lich. Brit. 79; Leight. Lich. Fl. 285; ed. 3, 291. *L. recensa* Stirton in Scott. Nat. v. 219 (1880); A. L. Sm. Monogr. i. 470 (1918). *Lichen rivulosus* Sm. Engl. Bot. t. 1737 (1807).

Essicc. Leight. n. 302; Mudd n. 168; Larb. Lich. Hb. n. 309; Johns. n. 353.

Easily recognized by the brownish-black hypothalline lines with which the thallus is usually intersected, and which suggested the specific name. When the thallus is more granulose, the granules are depressed, plane, and either contiguous or discrete (f. *depressa* Leight. ed. 3, 291). Very rarely it is evanescent, the hypothallus and fructification only being visible (f. *depauperata* Leight. l. c.). The numerous though scattered apothecia are in moist situations often brownish-flesh-coloured, but become darker in the herbarium. The spermatogones are frequent, verruciform, scattered or confluent, with spermatia oblong, 3-4 μ long, 1 μ thick.

Hab. on rocks, chiefly granitic and quartzose, in maritime and mountainous districts.—*Distr.* Rather local, but plentiful where it occurs, in the Channel Islands, S., W. and N. England, Wales, Scotland and N.W. Ireland.—*B.* M. Sark and Guernsey; near Haytor, Dartmoor, Devon; Roscoila and Kymval Cliff, Penzance, Cornwall; near Seaford, Sussex; near the Buckstone, Staunton, Gloucestershire; Mynydd Gader, Dolgelly, Barmouth, and Cader Idris, Merioneth; Beddgelert, Carnarvon; Holyhead, Anglesea; Kildale Moor, Cleveland, Yorkshire; the Cheviots, Northumberland; Alston, Cumberland; Barcaldine and Appin, Argyll; Crianlarich, Ben Lawers, Craig Var (Kinloch-Rannoch) and Ben-y-gloe, Perthshire; Nigg, Portlethen, and Cove, Kincardineshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Kylemore, Connemara, Galway; Clare Island and Achill Island, Mayo.

Form *obscurior* Cromb. ex Leight. Lich. Fl. ed. 3, 291 (1879).—Thallus rimose-areolate, thinnish, brownish-black; hypothallus predominating. Apothecia sessile, somewhat small; otherwise as in the species.

The numerous and crowded hypothalline lines everywhere intersecting the thallus give it a very dark appearance, akin to f. *depauperata* Leight. l. c.

Hab. On quartzose rocks in mountainous regions.—*Distr.* Found only very sparingly in N. Wales and on the N. Grampians, Scotland.—*B.* M. Llyn Dinas near Beddgelert, Carnarvonshire; Morrone, Braemar, Aberdeenshire.

118. *L. Kochiana* Hepp Lich. Fl. Würz. 61 (1824); Nyl. Lich. Scand. 223.—Thallus determinate, smooth, rimose- or deeply areolate, mouse-coloured or pale-greyish-brown; the areole plane or somewhat convex (K —, CaCl —); hypothallus black, limiting the thallus. Apothecia moderate or somewhat large, innate, plane, immarginate, often flexuose- or angulose-diform, black, dark within; hypothecium thin, colourless; paraphyses discrete (NO₃ —); spores shortly ellipsoid or subglobose,

8–11 μ long, 6–8 μ thick; hymenial gelatine bluish, the apices of the asci at length wine-red, with iodine.—Cromb. Lich. Brit. 79; Leight. Lich. Fl. 281; ed. 3, 285. *L. rivulosa* var. *Kochiana* Mudd Man. 199. *Biatora rivulosa* var. *Kochiana* Fr. Lich. Eur. 272 (1831). *Lecanora mammillifera* Stirt. in Trans. Glasg. Soc. Field Nat. 1875, 85; A. L. Sm. Monogr. i. 309 (1918).

Differs from the preceding mainly in the absence of intersecting hypothalline lines, in the darker innate immarginate apothecia, and the more globose spores. It is rather a variable plant, according to the habitat, but presents only the following well-marked variety. The apothecia, which are even with the thallus, are in a very young state thinly margined, but the margin is speedily evanescent.

Hab. On rocks and boulders in mountainous regions.—*Distr.* Only here and there in Great Britain; not seen from Ireland or the Channel Islands.—*B. M.* Trelick, Monmouthshire; Cader Idris, Merioneth; Pen-y-gwryd, Snowdon, Carnarvonshire; Ystrad-ffn, Carmarthenshire; Llanyrtud, Breconshire; Kildale and near Ayton, Cleveland, Yorkshire; Eskdale, Cumberland; New Galloway, Kirkcudbrightshire; Craig Rossie, The Ochils, and Ben-y-Gloe, Perthshire; Upper Glen Dee and Morrone, Braemar, Aberdeenshire; Hills of Applecross, Ross-shire.

Var. *lygæa* Leight. Lich. Fl. 282 (1871).—Thallus dark, umber-brownish-coloured, effuse, continuous, smooth, slightly cracked-areolate. Apothecia smaller than in the species.—Leight. Lich. Fl. ed. 3, 286. *Lecidea lygæa* Ach. Syn. 34 (1814) (excl. vars. *pelidna*, etc.).

Distinguished by the thinner and smoother thallus and by the minute apothecia. Occasionally the thallus is intersected and limited by the dark hypothallus and the apothecia are rather larger.

Hab. On rocks in maritime and mountainous regions.—*Distr.* Somewhat rare in the Channel Islands, Wales, the Grampians of Scotland and W. Ireland; not recorded from England.—*B. M.* Boulay Bay, Jersey; Sark; Dolgelly, Barmouth and Cader Idris, Merioneth; Beddgelert and Snowdon, Carnarvonshire; Crianlarich, Perthshire; Doughruagh Mt. and Letterfrack, Galway.

119. *L. mollis* Nyl. Lich. Scand. 223 (1861).—Thallus determinate, minutely cracked-areolate, slightly furfuraceous on the surface, greyish or pale-brownish-grey (\bar{K} —, CaCl —); hypothallus blackish, limiting the thallus. Apothecia rather small, superficial, with thickish entire margin, black or brownish-black, whitish within; hypothecium colourless; paraphyses stoutish, loosely coherent, thicker and blackish at the apices; spores shortly ellipsoid or subglobose, 7–9 μ long, 5–6 μ thick; hymenial gelatine pale-bluish, the asci at length wine-coloured, with iodine.—Leight. Lich. Fl. 277 pro parte; ed. 3, 280 pro parte. *L. rivulosa* var. *mollis* Wahlenb. Fl. Lapp. 472 (1812).

Differs from *L. rivulosa* in thalline characters. Th. Fries (Lich. Scand. 45) describes the paraphyses as brown or black at the apices. In our specimen they are blackish-green.

Hab. On quartzose rocks.—*B. M.* Morrone, Braemar, Aberdeenshire.

120. *L. pammieta* Stirton in Grevillea iii. 34 (1874).—Thallus whitish or greyish, thick, cracked-areolate, the areolæ minutely papillose (K + yellow, then orange-red). Apothecia black, sessile, plane, or somewhat convex with an undulate sometimes paler margin, the disc almost constantly gyrose-plicate; hypothecium colourless; paraphyses stout, coherent, with blackish clavate apices; spores ellipsoid, 8–10 μ long, 5–6 μ thick.—Leight. Lich. Fl. ed. 3, 283.

Collected by Dr. Stirton on Ben Arthur (The Cobbler), Argyll, and considered by him to be allied to *L. mollis* or *L. tessellata*, but distinguished by the chemical reaction of the thallus and other characters.

Hab. On rocks.—*B. M.* Ben Arthur, Argyll.

121. *L. interludens* Nyl. in Flora liii. 35 (1870).—Thallus determinate, thin, cracked-areolate, whitish or greyish-white (K + tawny-yellow, CaCl —); the areolæ plane, minutely rugulose; hypothallus blackish. Apothecia superficial, somewhat convex, black, immarginate, or often plane with a very thin white epithalline margin, colourless within; paraphyses clavate and brownish at the apices; spores ellipsoid, 10–12 μ long, 6–8 μ thick; hymenial gelatine bluish, the asci wine- or violet-reddish, with iodine.—Cromb. in Journ. Linn. Soc. xi. 485 (1871); Leight. Lich. Fl. 287; ed. 3, 292.

Near *L. mollis*, but distinguished by the firmer whiter thallus, the positive reaction with K, and especially by the form of the larger spores. The thallus is distinctly limited, and also here and there intersected by the hypothallus. The two specimens gathered are well fertile. The not uncommon spermogones have the spermatia somewhat short.

Hab. On a quartzose boulder in a subalpine locality.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

122. *L. restricta* Stirton in Trans. Glasg. Soc. Field Nat. 1875, 88.—Thallus blackish-grey, wrinkled, thin. Apothecia black, adnate, small, plane, obtusely margined; hypothecium colourless; paraphyses distinct, filiform, the epithecium brownish; asci saccate; spores ellipsoid, 13–17 μ long, 8–10 μ thick; hymenial gelatine blue, then yellowish with iodine.—Leight. Lich. Fl. ed. 3, 298.

The specimen in Hb. Stirton was too small for examination.

Hab. On rocks, Blair Athole, Perthshire.

123. *L. coriacella* Nyl. in Flora lxxv. 454 (1882).—Thallus effuse, thinnish or moderate, somewhat smooth, leathery, imbedded in the rock, blackish-grey (K —, CaCl —). Apothecia submoderate, innate, opaque, immarginate, blackish; hypothecium colourless; paraphyses moderate, the epithecium brown;

spores ellipsoid, 10–12 μ long, 6 μ thick; hymenial gelatine bluish, then tawny wine-red, with iodine.—Cromb. in Grevillea xii. 90.

Hab. On porphyritic rocks in an upland district in N.W. England.—*B. M.* Red Screes, Westmorland.

124. *L. periplaca* Nyl. in Flora lxv. 454 (1882).—Thallus determinate, thin or very thin, smoothish, thinly areolate-rimulose, greyish-black, subbyssoid and applanate-lobate at the circumference. Apothecia small, slightly margined, at length somewhat convex, black; hypothecium colourless; paraphyses submoderate; epithecium and perithecium brown; spores ellipsoid, obtuse at the apices, 9–10 μ long, 6 μ thick; hymenial gelatine bluish then deep yellow, the asci wine-reddish, with iodine.—Cromb. in Grevillea xii. 91.

Distinguished by the form of the thallus at the circumference, where it is very thinly or subobsoletely whitish-bordered. The spermogones, here and there visible, have the spermatia oblong, 3–4 μ long, 1 μ thick.

Hab. On rocks and stones.—*B. M.* Staveley, Kendal, Ravensborough Crag and top of Dan Hill, Westmorland.

125. *L. tenebrica* Nyl. in Flora lxv. 454 (1882).—Thallus subdeterminate, thinnish, unequal, areolate-rimose, dark-greyish (K —, CaCl). Apothecia rather small, convex, immarginate, black, within whitish; epithecium and lower stratum of the hypothecium brown; paraphyses not very well discrete; spores ellipsoid, 10–12 μ long, 5–6 μ thick; hymenial gelatine bluish then tawny-tellow with iodine.—Cromb. in Grevillea xii. 90.

Resembles *L. griseoatra*. The spermogones have the spermatia bacilliform, straight, 3.5 μ long, .7 μ thick.

Hab. On schistose rocks, in an upland district in N.W. England.—*B. M.* Red Screes, Westmorland.

126. *L. contenebricans* Nyl. in Flora lxvi. 533 (1883).—Thallus indeterminate, submoderate, smoothish, deeply-rimose, dark-greyish or greyish-brown, within white (medulla I +, K + yellow, then rusty-red). Apothecia large, somewhat plane, margined, black, within whitish (the lower stratum dark-brown); epithecium bluish-black (NO₃ + violet-red); hypothecium reddish-brown; spores ellipsoid, 10–11 μ long, 5–6 μ thick; hymenial gelatine bluish, then tawny-violet, especially the asci, with iodine.—Cromb. in Grevillea xii. 90.

Distinguished from *L. tenebrica* by the larger margined apothecia and by the chemical reactions.

Hab. On schistose rocks, sparingly.—*B. M.* Red Screes, Westmorland.

127. *L. griseoatra* Schær. Enum. 101 (1850).—Thallus subdeterminate, thinnish or submoderate, somewhat smooth, opaque,

rimose-areolate or areolate-granulose, blackish, rarely pale-greyish or lead-coloured; the areolae more or less tumid, crowded or dispersed (K \mp yellowish, CaCl —, K(CaCl) + yellow then rose-red, quickly disappearing), medulla I + reddish; hypothallus thin, black, limiting the thallus. Apothecia small, subinnate, at length partly prominent, at first depressed, then plane, at times convex, black, the margin thin, entire or obsolete; hypothecium thin, nearly colourless or brownish; paraphyses discrete, bluish-black at the apices; spores ellipsoid, 10–17 μ long, 6–8 μ thick; hymenial gelatine bluish then sordid, the asci tawny-wine-red, with iodine.—*L. tenebrosa* Flot. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 373 (1856); Mudd Man. 204; Cromb. Lich. Brit. 85; Leight. Lich. Fl. 281; ed. 3, 283.—*L. endocyanea* Stirt. in Scott. Nat. iv. 165 (1877); A. L. Sm. Monogr. ii. 17 (1911). *Verrucaria griseoatra* Hoffm. Deutschl. Fl. ii. 182 (1795).

Exsicc. Leight. n. 188 (in some sets); Cromb. n. 185.

From its appearance this has sometimes been placed in *Lecanora*, near *L. cinerea*. The thallus is occasionally partly limited by the hypothallus, which is in young plants radiating. It has been noted by Zahlbruckner that a small portion of the thallus placed on a slide gives the reaction K(CaCl) as stated above (Bot. Abt. k. k. Nat. Hist. Mus. (Wien) xv. n. 2, 180 (1902)). In our specimens the apothecia are usually numerous and not unfrequently abortive. The asci are cylindrical-clavate, somewhat lax, and with the paraphyses separate readily from the hypothecium. The spermatogones, rarely present, have the spermatia short, straight, bacillar, 6–9 μ long, about 1 μ thick (*vide* Th. M. Fries Lich. Scand. 541).

Hab. On rocks in maritime and mountainous districts.—*Distr.* Local, though plentiful where it occurs in the Channel Islands, N. England and Wales, among the Grampians, Scotland; apparently rare in S.E. Ireland.—*B. M.* Noirmont, Jersey; Sark; Malvern Hills, Worcestershire; Abdon Burf, Shropshire; Cader Idris, Barmouth, and Dolgelly, Merioneth; Cwm Idwall, Nant Francon, Carnarvonshire; Windermere, Westmorland; Cleveland, Yorkshire; Achosragan Hill, Appin, Argyll; Crianlarich, Craig Tulloch, Ben Lawers, and Ben-y-gloe, Perthshire; Portlethen, Kincardineshire; Glen Callater and Morrone, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire; Ben More, I. of Mull; near Cork.

128. *L. athrocarpa* Ach. Meth. 41 (1803).—Thallus indeterminate, flattened, areolate-diffract, subopaque, greyish- or brownish-black (K —, CaCl —, medulla I + bluish); hypothallus black, only here and there visible. Apothecia adnate, plane, at length slightly convex, thinly margined, often subangulose, black; hypothecium colourless or brownish; paraphyses slender, soft, somewhat irregular; epithecium brownish; spores ellipsoid, 18–20 μ long, 9–11 μ thick; hymenial gelatine bluish, then partly wine-red with iodine.—*L. atrofuscescens* Nyl. in Flora xlix. 371 (1866); Cromb. Lich. Brit. 83; Leight. Lich. Fl. 286; ed. 3, 292. *Lichen athrocarpus* Ach. Prodr. Lich. Succ. (1798).

Intermediate between *L. fuscoatra* and *L. griseoatra*, but readily distinguished from these and the allied species by the larger spores. The thallus generally spreads somewhat extensively over the substratum, though at times interruptedly when associated with other lichens. In our specimens the apothecia are numerous, crowded but distinct, and usually angulose. The spermogones, here and there visible, have the spermatia bacillar, 7-9 μ long, 1 μ thick (*vide* Nyl. in *Flora lxx.* 134 (1887)).

Hab. On rocks and boulders, schistose and greenstone, in upland situations.—*Distr.* Seen only from two localities in Scotland.—*B. M.* King's Park, Stirling; Ben Lawers, Perthshire.

129. *L. confusula* Nyl. in *Flora* lv. 360 (1872).—Thallus thinnish, indeterminate, granulate or granulate-conglomerate, the glomerules thin, scattered, olive-grey or greyish-brown (K —, CaCl —). Apothecia small, adnate, convex, immarginate, black; hypothecium colourless; paraphyses conglutinate; epithecium yellowish-brown; spores ellipsoid, 7-11 μ long, 4-5 μ thick; hymenial gelatine wine-red with iodine.—Cromb. in *Grevillea* i. 61; Leight. Lich. Fl. ed. 3, 266.

Hab. On micaceous rocks or on walls.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

130. *L. nigrificans* Nyl. in *Flora* lix. 307 (1876).—Thallus indeterminate, effuse, thin, rugulose, areolate-cracked, opaque, blackish, internally green (K —). Apothecia small, sub-prominent, plane, slightly margined, black, the margin at times bluish-grey-pruinose; hypothecium colourless; paraphyses distinct, moderate; the epithecium blackish-blue-green; spores ellipsoid, 11-12 μ long, 6-7 μ thick; hymenial gelatine wine-red with iodine.—Cromb. in *Grevillea* v. 27; Leight. Lich. Fl. ed. 3, 292.

Distinguished from *L. confusula* by the darker thallus and by the apothecial characters.

Hab. On a schistose rock in a maritime district.—*B. M.* Killery Bay, Connemara, Galway (the only locality).

131. *L. asperella* Stirton in *Trans. Glasg. Soc. Field Nat.* 1875, 87.—Thallus black, thickish, granular, furfuraceous, cracked-areolate, determinate. Apothecia black, small, adnate, plane, the margin thin, shining; hypothecium colourless, subtended by a brownish-black excipulum; paraphyses not very distinct, the apices clavate, bluish; spores oblong-ellipsoid, 7-10 μ long, 4-5 μ thick; hymenial gelatine intensely and persistently blue with iodine.—Leight. Lich. Fl. ed. 3, 283.

Our portion of Stirton's specimen is too minute for examination. The species was regarded by Stirton as close to *L. furvella*, but the colourless hypothecium is a sufficiently distinguishing character and places it in this group.

Hab. On rocks.—*B. M.* Ben-y-gloe, Perthshire.

132. *L. orphnæilla* Stirton in Scott. Nat. iv. 166 (1877).—Thallus black, opaque, minutely granular-furfuraceous, continuous. Apothecia black, sessile plane or somewhat convex, with a shining, irregularly lobate margin; hypothecium colourless; paraphyses rather slender, generally confluent, indistinct and dividing into small cells at the tips, the epithecium bluish-black (NO_3 + dull violet); asci rather swollen: spores narrowly oblong, slightly bent, 13–18 μ long, 3–4 μ thick (generally about 14–15 μ long); hymenial gelatine intensely blue with iodine.—Leight. Lich. Fl. ed. 3, 254. *L. amphiplecta* Stirton *op. cit.* v. 219 (1880); A. L. Sm. Monogr. Brit. Lich. i. 471 (1918).

Stirton considered *L. amphiplecta* as similar to *L. furvella* except for the colourless hypothecium and with "paraphyses concrete and as if reticulate and the epithecium thick, confluent and brownish-black." The small non-fertile specimen at the British Museum is exactly like *L. orphnæilla*.

Hab. On rocks.—B. M. Ben More, Island of Mull (as *L. orphnæilla*); Ben Lawers, East Clump, Perthshire (as *L. amphiplecta*).

133. *L. leiotea* Nyl. in Flora l. 328 (1867).—Thallus determinate, thin, continuous, smooth, obsoletely cracked, slimy-brown or greyish-black. Apothecia rather small, adnate, plane, black with an obtuse or indistinct margin; hypothecium colourless; paraphyses becoming thicker and brownish at the apices; spores ellipsoid, 8–11 μ long, 6–7 μ thick; hymenial gelatine pale-bluish with iodine.—Carroll in Journ. Bot. v. 256 (1867); Cromb. Lich. Brit. 85; Leight. Lich. Fl. 291; ed. 3, 297.

The thallus is sometimes gelatinous, resulting probably from the habitat. In the British specimens the apothecia are rather scattered. Spermatogones are frequent with simple short sterigmata and oblong spermatia about 4 μ long, 1.5 μ thick.

Hab. On shady rocks in mountainous districts.—*Distr.* Local and scarce in N. Wales and S.W. Ireland.—B. M. Trefriw Falls, Denbighshire; Croghan, Killarney, Kerry.

2. Hypothecium reddish-brown to dark-brown or blackish. (134 203). (See also *L. turgidula*, *L. parasema*, *L. latypea*, *L. tenebrica* and *L. contenebricans*.)

134. *L. jurana* Schær. Enum. 123 (1850).—Thallus effuse, thin, continuous, subrimulose or scattered, whitish or bluish-grey, often farinose or almost obsolete (K —, CaCl —). Apothecia adnate, somewhat large and scattered, at first concave then plane with thickish prominent flexuose margin, often irregular and 2–3 connate, black, naked; paraphyses subcoherent; hypothecium and epithecium blackish; spores ellipsoid, 16–18 μ long, 10–11 μ thick; hymenial gelatine deep-blue with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 4, iv. 199 (1869); Lich. Fl. 299; ed. 3, 310,

In the British specimens the thallus is either rather scattered (form *dispersa* Arnold in Flora li. 35 (1868)), or more commonly scarcely visible. The apothecia are rather variable, being frequently, as Schærer says, minute and several aggregate with a common exciple. This, as in other cases, is owing to the growth of young fruit upon the old.

Hab. On calcareous rocks in hilly and mountainous districts.—*Distr.* Seen from only a few localities in W. and Central England, N. Wales and the Grampians, Scotland.—*B. M.* Bathampton Downs, Somerset; Black Dale, near Buxton, Derbyshire; Lyn Cae, Cader Idris, Merioneth; Cunswick Scar, Whitbarrow and Mallerstang, Westmorland; Achosragan Hill, Appin, Argyll; Craig Tulloch, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire.

135. *L. subumbonella* Lamy in Bull. Soc. Bot. Fr. xxx. 409 (1883).—Thallus effuse, thinnish, unequal, white, subopaque (K —, CaCl —). Apothecia minute or subminute, somewhat plane, margined, umbonate in the centre, black, opaque; hypothecium thickish, brown; paraphyses subcoherent, pale-brown at the apices; spores oblong-ellipsoid, 16–22 μ long, 7–9 μ thick; hymenial gelatine bluish, the asci at length tawny-wine-red, with iodine.—*L. subumbonata* Nyl. in Flora lix. 236 (1876), non in Flora lv. 358 (1872); Cromb. in Grevillea v. 28; Leight. Lich. Fl. ed. 3, 306.

Exsicc. Johns. n. 429.

The apothecia, frequent in the specimens from Ireland, often appear as if divided into several hymenia. The spermogones, sparingly present, have the spermatia cylindrical, or fusiform-cylindrical, 4–7 μ long, 0.8 μ thick. Johnson's specimen from Cumberland has a somewhat thicker areolate thallus, and the apothecia are occasionally aggregate.

Hab. On mica-schist rocks in upland situations.—*B. M.* Wastdale, Cumberland; near Letterfrack, Connemara, Galway.

136. *L. contortula* Stirton in Scott. Nat. iv. 167 (1877).—Thallus pale or leaden-grey, thickish, somewhat wrinkled, rimose-areolate (K —, CaCl —). Apothecia black, adnate, rather large, plane or somewhat convex, umbonate or gyrose-plicate, with a thick margin; hypothecium brownish-black, brownish upwards; paraphyses distinct, brown at the apices; spores oblong or fusiform oblong, 15–21 μ long, 6–7.5 μ broad, hymenial gelatine blue then wine-red with iodine.—Leight. Lich. Fl. ed. 3, 307.

Stirton considered his species as allied to *L. subumbonella*, but in *L. contortula* the paraphyses are slender and distinct and bright olivaceous-green to brown at the apices. The gyrose character as in *L. jurana* is due to the inclusion of several small apothecia of varying stages of development within a rather flexuose common exciple. Johnson's specimen from Bywell is more akin to *L. contigua* var. *platycarpa*.

Hab. On rocks.—*B. M.* Near Salen, I. of Mull, Argyll.

137. *L. consentiens* Nyl. in Flora xlix. 371 (1866).—Thallus whitish, smooth, subdeterminate, cracked-areolate, the areolæ plane or slightly convex (K —, CaCl —), occasionally with pale- or reddish-brown cephalodia (superficial granules enclosing blue-green algæ). Apothecia black or brownish-black, innate, concave or at length plane, obtusely margined; hypothecium thin, blackish-brown; paraphyses slender, discrete, dark-brown at the apices; spores ellipsoid or ellipsoid-oblong, large, 27–38 μ long, 16–22 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Carroll in Journ. Bot. v. 255 (1867); Cromb. Lich. Brit. 80; Leight. Lich. Fl. 296; ed. 3, 305. *L. scutellata* Stirton in Grevillea iii. 34 (1874); Cromb. *tom. cit.* 143 (1875); Leight. Lich. Fl. ed. 3, 296.

Closely allied to the following species, from which it differs in the more contiguous, at times subrugose thallus, absence of reactions, and in the more concave, immersed apothecia. In the original specimen cephalodia are absent, as is usually the case in Britain.

Hab. On schistose rocks in mountainous regions.—*Distr.* Only sparingly in N. Wales, N. England, and on the S. Grampians, Scotland.—*B. M.* Cader Idris, Merioneth; Snowdon, Carnarvon; Ravensborrow Crag and Nan Bield, Westmorland; Craig Calliach, above Loch-na-Gat, and near the summit of Ben Lawers, Perthshire.

Form *circumscissa* Nyl. ex Cromb. in Journ. Bot. xx. 275 (1882).—Thallus pinkish-white; apothecia somewhat small, immarginate, circumsciss-lecanoroid; otherwise as in the type.

From the apothecia having apparently a thalline margin, this might readily be taken for a *Lecanora* of the section of *L. cinerea*. Cephalodia are present in some of the specimens.

Hab. On schistose rocks in mountainous regions.—*Distr.* Extremely local and scarce in N. Wales and on one of the S. Grampians, Scotland.—*B. M.* Snowdon, Carnarvonshire; Craig Calliach, Perthshire.

138. *L. panæola* Ach. in Vet. Ak. Handl. xxix. 267 (1808) & Lich. Univ. 201.—Thallus determinate, warted-areolate, thinnish or somewhat thick, greyish-white, whitish or cream-coloured, the areolæ tumid, rimose-diffract, smooth (Kf + yellowish, CaCl + reddish, K (CaCl) + deep red), cephalodiferous, the cephalodia tuberculate, reddish; hypothallus dark-brown. Apothecia small or moderate, appressed or immersed, at first concave, then plane, at length convex, black or brownish-black, pruinose or denudate, the margin thickish at length excluded; hypothecium thick, blackish; paraphyses slender, brown or dark-brown at the apices; spores ellipsoid or ovoid, 17–27 μ long, 8–12 μ thick, often halonate and then 27–30 μ long, 18–20 μ thick; hymenial gelatine deep-blue with iodine.—Carroll in Journ. Bot. v. 255 (1867); Leight. in Ann. Mag. Nat. Hist. ser. 4, iv. 199 (1869); Cromb. Lich. Brit. 80; Leight. Lich. Fl.

280; ed. 3, 284 (incl. f. *subconsentiens*). *L. cechumena* Tayl. in Mackay Fl. Hib. ii. 117 (1836) (non Ach.). *Lichen athrocarpus* Sm. Engl. Bot. t. 1829 (1808) (non Ach.). *Aspicilia athrocarpa* Mudd Man. 164 (1861).

Exsicc. Johns. n. 430 (as f. *subconsentiens*); Leight. n. 384; Larb. Lich. Hb. n. 142.

This and the preceding are well characterized by the thallus being variegated by more or less frequent reddish-grey cephalodia intermixed with the areolæ. The thallus varies in thickness, being at times very thin and plane (form *obliterata* Leight. Lich. Fl. ed. 3, 285), probably from being denuded by water, and also in colour, which is occasionally somewhat leaden-coloured, evidently owing to maceration from a sterile crustaceous lichen with which it is associated. In its fully developed condition, and with pruinose apothecia, it is var. β *elegans* Th. Fr. in Nov. Act. Reg. Soc. Upsal. 307 (1861); this form occurs rarely on the Scottish mountains. The apothecia, common in the British specimens, are at times somewhat crowded and then more or less angulose. When young, they are concave and immersed in the areolæ with, as it were, a spurious thalline margin (form *subconsentiens* Leight. Lich. Fl. ed. 3, 284 (1879)).

Hab. On rocks and stones, granitic and schistose, rarely arenaceous, in mountainous regions.—*Distr.* Rare in the North of England, more frequent in Wales and Ireland, and in the central counties of Scotland.—*B. M.* Cader Idris and Corwen, Merioneth; Snowdon, Carnedd Dafydd, Glyder Mts., Trefriw and Llyn Ogwen, Carnarvon; Abden Burf, Shropshire; Teesdale, Durham; Staveley, Nan Bield, Pugh Crag, Kentmere and Ravensborrow Crag, Kent River Valley, Westmorland; Ennerdale, Cumberland; West Water, Fife; Ben Lawers, Craig Calliach, Crianlarich, and Glen Falloch, Perthshire; Canlochan, Forfarshire; Lochgilphead, Barcaldine, Lorne, and Ben Cruachan, Argyll; Glen Callater and Craig Guie, Braemar, Aberdeenshire; Glen Nevis, Lochaber, and Invermoriston, Inverness-shire; Cuchullin Hills, Isle of Skye; Applecross, Ross; Loch Shin, Sutherland; Brandon Mt. and Mangerton, Kerry; Kylemore, Doughruagh Mt., Connemara and Ballynakill, Galway.

139. *L. corollidia* Stirton in Trans. Glasg. Soc. Field Nat. 1875, 88.—Thallus pale or pallid-ashy-grey, somewhat thick, diffract-areolate, rather plane (K + yellow then red). Apothecia black, adnate, large, plane, rugose, sometimes bluish-grey-pruinose with a flexuose obtuse margin; hypothecium thick, dark-brownish-black; paraphyses indistinct, brown at the apices; spores ellipsoid, 15–20 μ long, 8–11 μ thick.—Leight. Lich. Fl. ed. 3, 296.

Stirton has suggested that this lichen may be a form of *L. Mooreana*, but it differs in the large auriculate apothecia, the larger spores and other internal characters of the apothecium.

Hab. On rocks.—*Distr.* In upland districts of N. England and N. Scotland.—*B. M.* Arncliffe, Yorkshire; near Thurso, Caithness.

140. *L. contigua* Fr. Lich. Eur. 298 (1831) pro parte.—Thallus greyish-white or sometimes ash-grey, usually rather thin, continuous, finely cracked granular or areolate, the areolæ

continuous and flat or sometimes convex and somewhat tumid (K —, CaCl —); hypothallus black. Apothecia seated on the thallus, varying in size, .5 mm. to 2 mm. wide, plane or convex, somewhat rough, the margin thick obtuse, prominent, or generally almost obliterated; hypothecium thick, blackish-brown; paraphyses slender, subcoherent, dark- or olivaceous-brown at the apices; spores ellipsoid, large, 16–27 μ long, 8–13 μ thick; hymenial gelatine blue then wine-red with iodine.—Mudd Man. 209 (excl. syn.); Cromb. Lich. Brit. 80 (excl. vars. *crustulata* and *speirea*); Leight. Lich. Fl. 292; ed. 3, 299 (excl. forms *meiospora* and *aggerata*). *Verrucaria contigua* Hoffm. Deutschl. Fl. ii. 184 (1795).

Exsicc. Johns. nos. 381 (f. *limitata*), 380; Leight. nos. 155, 156, 357; Mudd n. 180 (as *L. confluens*).

The thallus and apothecia of this lichen vary considerably in appearance, giving rise to a large number of varieties which have been described by Leighton as forms. They are all distinguished by the constant characters of the apothecium, its thick dark-coloured hypothecium and somewhat large ellipsoid spores. When the thallus is limited and intersected by the hypothallus, it is f. *limitata* Leight. (Lich. Fl. 292; ed. 3, 299); when it occurs in round somewhat furfuraceous patches with rather small apothecia, it is f. *leprosa* Leight. (ll. c.). Another series of forms have a thick well-developed thallus and occasionally very large apothecia; var. *nobilis* Fr. (l. c. 301, f. *nobilis* Leight. ll. c.) is characterized by having the thallus thick, tartareous, areolate and turgid; while f. *Hoffmanni* Leight. (ll. c.) is lighter in colour and less turgid with larger apothecia. In var. *notabilis* Nyl. (in Not. Sällsk. Faun. & Fl. Fenn n. ser. i. 241 (1859)), (f. *notabilis* Leight. l. c. ed. 3, 302), the thallus is whitish and unequally minutely granulose, the granules dispersed or sometimes in small clusters (acervulate), resembling the thallus of *Stereocaulon condensatum*. Leighton describes a further evidently rare form as f. *pustulata* (l. c. 302), which is yellowish-grey, limited by the black hypothallus, and areolate, the areolæ plane with central sorediate protuberances; some of these are enlarged into orbicular, rather flat tubercles, in which are embedded a conglomeration of minute marginate black apothecia.

Hab. On rocks in maritime or hilly regions.—*Distr.* Common throughout Great Britain and Ireland.—*B. M.* Endellion and Roscoila, Cornwall (f. *limitata*); Crown, East Down, Dartmoor, Devon; Leith Hill, Surrey; Charnwood Forest, Leicester; near Malvern, Worcester; Caer Caradoc, Haughmond Hill (f. *leprosa*), and near Ludlow, Shropshire; near Monmouth; Aran Mawddwy, Llyn Aran, Cader Idris, and Dolgelly, Merioneth; Carnedd Dafydd, Nant Ffrancon, Beddgelert, and Capel Curig, Carnarvon; Roughton, Lincoln; Ayton, Cleveland, Yorkshire; Teesdale, Durham; Staveley, Croggs Bridge, Red Screes, Langdale, Mardale, and Pugh Crag, Westmorland; near Whitehaven and St. Bees, Cumberland; Westwater, Forfar; Loch-na-gat, Ben Lawers, Killin, near Crieff, Glen Lochay, Craig Calliach, and Ben-y-gloe, Perthshire; Barcaldine, Lorne, Achosragan Hill, Appin and Island of Lismore, Argyll; Morrone, Braemar, Aberdeenshire; Brandon Mt., Kerry; near Cork; Lettermore and Kylemore, Connemara, Galway; Slievemore Mt., Achill Island, Mayo.

Form *calcarea* Leight. Lich. Fl. 292 (1871).—Thallus creamy-white, tartareous, smooth, areolate, the areolæ plane or slightly convex, contiguous. Apothecia appressed, becoming superficial, plane or slightly convex.—*L. contigua* var. *calcarea* Fr. Lich. Eur. 302 (1831) (excl. syn); Leight. *op. cit.* ed. 3, 300.

A well-marked form with white rather shining smooth thallus rather like *L. albocoerulescens*; it is included in the species by Continental writers.

Hab. On rocks.—*Distr.* Not unfrequent in England, Wales and W. Ireland; not recorded from Scotland.—*B. M.* St. Austel, St. Minver and St. Wenn, Cornwall; Okehampton, Devon; Beddgelert, Carnarvon; Kylesmore, Connemara, Galway.

Var. *platycarpa* Fr. Lich. Eur. 300 (1831).—Thallus diffuse, whitish or greyish, thin or at length disappearing. Apothecia small, moderate in size or large, up to 2 mm. wide, at first plane with a tumid prominent margin, becoming immarginate, sometimes appressed-adnate.—Mudd Man. 210 (incl. f. *steriza*); Cromb. Lich. Brit. 80; Leight. Lich. Fl. 292; ed. 3, 299 (incl. f. *steriza*). *L. platycarpa* Ach. Lich. Univ. 173 (1810); var. *steriza* Floerke ex Koerb. Syst. Lich. Germ. 249 (1856); var. *hydrophila* Fr. l. c. 301; f. *hydrophila* Leight. Lich. Fl. 293 (1871); ed. 3, 300. *Petallaria macrocarpa* DC. Fl. Fr. ii. 347 (1805).

Exsicc. Johns. n. 445; Mudd n. 179.

Distinguished from the type by the very scanty thallus, and the usually more persistent apothecial margin.

Hab. On rocks, more particularly in damp situations.—*Distr.* Not unfrequent in the hilly regions of N. England, Wales, Scotland and Ireland.—*B. M.* St. Leonards, Sussex; Nant Ffrancon and Beddgelert, Carnarvon; Lounsedale and Dent, Ayton Moor, Cleveland, Yorkshire; Bywell, Northumberland; Mardale, Westmorland; Alston and Cross Fell, Cumberland; Ben Lawers and near Tyndrum, Perthshire; Morrone, Braemar, Aberdeenshire; Doughruagh Mt., Connemara, Galway; Glendalough, Wicklow; Slievemore Mt., Achill Island, Mayo.

Var. *flavicunda* Nyl. Lich. Scand. 224 (1861).—Thallus rusty-red, rather thick, tartareous, areolate, the areolæ flat and smooth. Apothecia moderate in size or large, flat or somewhat convex, more or less whitish-pruinose.—Cromb. Lich. Brit. 80; f. *flavicunda* Leight. Lich. Fl. 294; ed. 3, 301. *L. flavicunda* Ach. Lich. Univ. 166 (1810).

Hab. On rocks.—*Distr.* Not unfrequent in maritime and hilly districts of S.W. and N. England, Wales and Scotland.—*B. M.* Carn Galven, near Penzance, Cornwall; Clee Hill, Shropshire; Cader Idris, Merioneth; Snowdon, Carnarvon; Ayton Moor, Cleveland, Yorkshire; Teesdale, Durham; Crossfell and Langdale, Westmorland; Borrowdale, Cumberland; Ben Beck, Sidlaw Hills, and Baldovan, Forfarshire; Ben Lawers, Perthshire; Craig Coinnoch and Morrone, Braemar, Aberdeenshire; Dunkerron, Kerry; Connemara, Galway; Errif River, Mayo.

141. *L. percontigua* Nyl. in Flora lxv. 457 (1882).—Thallus unequally granulate-areolate, ashy-grey (K + yellow then red). Apothecia large, umbonate, otherwise, as in *L. contigua*.—*L. contigua* var. *percontigua* A. L. Sm. Monogr. Part ii. 68 (1911).

Exsicc. Johns. n. 444.

As a number of specimens have been added to the herbarium in recent years in all of which the thalline reaction with potash is very pronounced, it has seemed advisable to give the plant specific rank as first published by Nylander.

Hab. On rocks.—*Distr.* Rare in Wales, more abundant in N. England.—*B. M.* Snowdon, Carnarvonshire; Reston Scar and Staveley, Northumberland; Barrowmouth, Whitehaven, Cumberland.

142. *L. petrosa* Arn. in Flora li. 36 (1868).—Thallus whitish, bluish- or yellowish-white, thinly cracked-areolate or almost obsolete (K —, CaCl —). Apothecia sessile or adnate, solitary or two or three together, at first plane with a prominent margin, brownish-black; hypothecium brownish or reddish-black; paraphyses stoutish, conglutinate, the hymenium faintly blue-green or coerulescent, the epithecium dark, purplish-bluish- or greenish-brown; spores ellipsoid, 16–30 μ long, 9–13 μ thick; hymenial gelatine blue with iodine.

Distinguished by the pervading blue colour internally of the apothecium which becomes violet on the application of potash.

Hab. On calcareous rocks.—*Distr.* Chiefly in hilly or mountainous regions.—*B. M.* Malham, Yorkshire; New Galloway, Kirkeudbrightshire.

143. *L. mersata* Stirton in Scott. Nat. v. 218 (1880).—Thallus pallid or bluish-white, sometimes faintly reddish, rather thin, almost continuous, smooth, here and there slightly cracked-areolate (K —, CaCl —). Apothecia adnate, black, rather large, plane, narrowly marginate becoming convex; hypothecium thick, brownish-black; paraphyses discrete, slender slightly clavate, clear greenish-blue at the tips; spores ellipsoid or fusiform-ellipsoid, 22–36 μ long, 8–11 μ thick; hymenial gelatine blue, the asci yellowish with iodine.

Nearly allied to *L. petrosa* but differing in the substratum and in the form of the thallus, &c. These differences might possibly be due to the submerged habitat. Stirton considered it as near to *L. cyanothalama* Nyl. (Flora lv. 358 (1872) from the Faroë Islands.

Hab. On granitic submerged rocks.—*B. M.* Loch Rannoch, Perthshire.

144. *L. solediza* Nyl. in Bull. Soc. Linn. Norm. sér. 2, vi. 292 (1872).—Thallus determinate, smooth, areolate-rimulose, crowdedly solediose, greyish; the soledia thin, plane, rotundate (K —, CaCl — medulla l — or + bluish); hypothallus blackish.

Apothecia large or submoderate, plane, margined, black, bluish-grey-pruinose; hypothecium brownish-black; paraphyses moderate or thickish; epithecium brownish; spores fusiform-ellipsoid, 15–22 μ long, 7–9 μ thick; hymenial gelatine, as also the asci, bluish with iodine.—Cromb. in Journ. Bot. xiii. 141 (1875); Leight. Lich. Fl. ed. 3, 305.

Essicc. Mudd n. 181; Johns. n. 349.

Differs from *L. contigua* in the peculiar soredia, the thicker paraphyses, and the reaction with iodine; Johnson gives the thalline reaction as $\text{CaCl} +$ yellowish in his specimen. The hypothallus limits the thallus and is occasionally elsewhere visible. In the British specimens the apothecia are usually somewhat scattered. The spermatogones have the spermatia straight, 6–8 μ long (*vide* Nyl. Lich. Pyr. Or. Obs. Nov. 63 (1891)).

Hab. On rocks, gneissic and schistose, in upland hilly situations.—*Distr.* Widely distributed and frequent in W. and N. England, N. Wales, and the S. Grampians, Scotland.—*B. M.* Malvern Hills, Worcestershire; Dolgelly, Merioneth; Dent and Langbaughrigg, Cleveland, Yorkshire; Reston Scar, Westmorland; Keswick, Cumberland; The Trossachs, Perthshire.

Form *depauperata* Cromb. ms.—Thallus thin, nearly esori-diose, greyish or glaucous-white, the areolæ dispersed; hypothallus predominating.

Probably only a less developed state with a few very small soredia here and there visible. The apothecia are but little pruinose. It seems to connect the type with form *esorediza* Nyl. ex Lamy in Bull. Soc. Bot. Fr. xxv. 454 (1878).

Hab. On calcareous rocks in a mountainous district.—*B. M.* Twelve Pins, Connemara, Galway; Clare Island, Mayo.

145. *L. tenebrans* Nyl. in Flora lix. 309 (1876). Thallus determinate, continuous, rimulose, leaden-greyish or dark-leaden-coloured (K —, CaCl —, medulla partly I + bluish); hypothallus black. Apothecia moderate in size, plane and thinly margined, then convex and immarginate, black; hypothecium thick, brownish-black; paraphyses slender, greenish-black at the apices; spores ellipsoid, 18–24 μ long, 10–13 μ thick; hymenial gelatine and asci persistently deep-blue with iodine.—Cromb. in Grevillea v. 28; Leight. Lich. Fl. ed. 3, 303.

Perhaps, as Nylander says, only a subspecies of *L. contigua*, differing chiefly in the dark colour of the thallus and in the reaction of the hymenial gelatine. In the two specimens seen the apothecia are here and there several confluent.

Hab. On schistose rocks in a mountainous region.—*B. M.* Summit of Doughruagh Mt., Connemara, Galway (the only locality).

146. *L. albocœrulescens* Ach. Meth. 52 (1803).—Thallus sub-determinate, thickish, smooth, continuous or at length cracked,

opaque, whitish or glaucous (K —, CaCl —); hypothallus blackish. Apothecia moderate in size, appressed, plane, black, bluish-grey-pruinose, the margin prominent, thinnish, naked, entire; hypothecium thick, brownish-black; paraphyses slender, coherent, dark at the apices; epithecium granulose; spores oblong or ellipsoid, 20–28 μ long, 7–10 μ thick; hymenial gelatine deep-blue, asci wine-reddish, with iodine.—S. F. Gray Nat. Arr. I. 467 pro parte; Hook. Fl. Scot. ii. 38 (excl. Syn. Engl. Bot.); Mudd Man. 211; Leight. Lich. Fl. 295; ed. 3, 303. *L. contigua* var. *albocærulescens* Nyl. Lich. Scand. 224; Cromb. Lich. Brit. 80. *Lichen albocærulescens* Wulfen in Jacq. Coll. ii. 184, t. 15, f. 1 (1788).

Exsicc. Johns. n. 506.

Frequently described as a subspecies or variety of *L. contigua*: it differs in the more regular whiter thallus and chiefly in the pruina on the plane apothecia, which, however, tends to disappear in old plants. The apothecia are numerous, often crowded and may become confluent.

Hab. On rocks and stones in maritime and upland districts.—*Distr.* Seen from only a few localities in Great Britain and in N.W. Ireland.—*B. M.* Near Land's End and Withiel, Cornwall; Ivy Bridge and Dartmouth, Devon; Beachy Head, Sussex; Leith Hill, Surrey; Stormy Down, Glamorganshire; Llandyssil, Cardiganshire; Tenby Pembrokeshire; Langbaughrigg, Cleveland, Yorkshire; Staveley Head, Kentmere and Langdale, Westmorland; St. Bees, Cumberland; Achosragan Hill, Appin, Argyll; near Achmore, Killin, Perthshire; Slegachan, Isle of Skye; near Tully, Galway; Bell, Clare Island, Mayo.

Var. smaragdula Knowles in litt.—Thallus continuous or dispersed, glaucous-white or white, with white hypothallus. Apothecia with slender subcoherent paraphyses, clear-green or greenish-blue at the tips.—A. L. Sm. Monogr. i. 470 (1918).

Differs from the species in the white hypothallus and in the clear green colour of the epithecium in section. These differences may possibly be due to the submerged habitat.

Hab. On coarse granitic rocks, completely submerged except in summer.—*B. M.* Shores of Lough Mahanaghan (1377 ft.), Wicklow. Collected by M. C. Knowles, Sept. 1914.

147. *L. phæenterodes* Nyl. in Flora lviii. 363 (1875) & lxi. 248 (1878).—Thallus whitish, firm, areolate, unequal (K + orange-yellow). Apothecia plane or convex, marginate, mostly rather large, the margin persistent, flexuose, the disc slightly bluish-grey-pruinose or naked; hypothecium dark reddish-brown; paraphyses slender, subcoherent, yellowish or tawny at the tips (brown in thick section); spores ellipsoid, 14–22 μ long, 8–12 μ thick; hymenial gelatine clear persistent blue with iodine. *L. albocærulescens* var. *alpina* Schaer. Spicil. ii. 143 (1828); Mudd

Man. 211; Leight. Lich. Fl. ed. 3, 303 and 546; A. L. Sm. Monogr. Brit. Lich. ii. 170 (1911).

The thallus is thicker and the apothecia more prominent than in *L. albocoerulescens*. There is a reddish tinge at the base of the hymenium, and the paraphyses are lighter at the tips than in *L. contigua*.

Hab. On damp siliceous rocks, or on soil among rocks, in maritime and mountainous districts.—*Distr.* Somewhat rare in Great Britain, Ireland and the Channel Islands.—*B. M.* Island of Sark, St. Mervyn, Cornwall; Aberedw, Radnorshire; Cader Idris, Merioneth; Langbaurghrigg, Cleveland, Yorkshire; Langdale, Westmorland; Ben Braekie, Perthshire; Achosragan Hill, Appin, Argyll; Glen Dee, Braemar, Aberdeenshire; Moher, Clare.

148. *L. nitescens* Leight. in Grevillea iv. 79 (1875).—Thallus white, thin, continuous, minutely and irregularly rimulose, effuse, indeterminate (K + yellow, CaCl + yellow). Apothecia numerous, small, somewhat convex, shining, immarginate; hypothecium thick, dark-brown reddish-brown in thin section; paraphyses distinct but conglutinate, the tips yellowish-brown or with a bluish tinge; spores oblong, or linear-oblong, $17\ \mu$ long, $5.5\ \mu$ thick. Leight. Lich. Fl. ed. 3, 306.

Specimen in Kew herbarium examined. The thallus and apothecia strongly resemble those of *L. phæenterodes*.

Hab. On rocks. Collected by Larbalestier at Salrock Road, Connemara.

149. *L. crustulata* Koerb. Syst. Lich. 249 (1855).—Thallus effuse, very thin, leprose-tartareous, subrimulose or slightly verruculose, greyish-white or brownish (K —, CaCl —); hypothallus black, usually scarcely visible or on flints predominant as a blackish stain. Apothecia small, sessile, plane, black, margined, the margin entire, sometimes becoming convex and shining; paraphyses concrete, olivaceous-brown or -black at the apices; hypothecium thick, brownish-black; spores oblong, $11\text{--}18\ \mu$ long, $6\text{--}9\ \mu$ thick; hymenial gelatine bluish then sordid, asci wine-red, with iodine.—Mudd Man. 209; Leight. Lich. Fl. 257; ed. 3, 249. *L. parasema* var. *crustulata* Ach. Lich. Univ. (1810) 176. *L. contigua* var. *crustulata* Cromb. Lich. Brit. 80.

Exsicc. Mudd n. 177; Leight. n. 333 (as *L. prominula*); Johns. n. 507.

Approaches some forms of *L. contigua*, but is well differentiated by the thin leprose thallus and the smaller apothecia and spores. Two forms are distinguished: var. *fuscella* Mudd (Man. 209 (1861)), the thallus looking like a dark stain on the sandstone, dotted with light-coloured areolæ, and f. *geographica* Cromb. ms. which is limited and intersected by the black hypothallus.

Hab. On arenaceous rocks and flints, very rarely lignicolous, in maritime and upland situations.—*Distr.* Only a few localities in England and Ireland; not seen from Scotland.—*B. M.* Lydd Beach, Kent (f.

geographica); Shere, Surrey; Launceston, Cornwall; The Downs, Lewes, near Hastings, Patcham, and Newhaven, Sussex; Lyndhurst Moor, Hants; Oaksey, Wiltshire (lignicolous); Hale's End, Malvern, Worcestershire; Stoughton, Leicestershire; Larch Bank, near Ayton, Cleveland, and Bilsdale (lignicolous), Yorkshire; Borrowdale, Reston Scar and Mallerstang, Westmorland; Keswick, Cumberland; Moffat Hills, Dumfriesshire; Ballinhassig, near Cork; Kylemore, Galway; near Dungannon, Tyrone.

Var. *meiospora* Olivier Exp. Syst. ii. 113 (1901).—Thallus whitish-grey, areolate or scattered, thicker than in the type. Apothecia often arranged in lines, black, plane, marginate, larger than in the species.—*L. contigua* var. *meiospora* Nyl. Lich. Scand. 225 (1861); f. *meiospora* Leight. Lich. Fl. ed. 3, 302 (1879).

Essicc. Larb. Lich. Hb. n. 310.

Th. Fries (Lich. Scand. 509, 1874) has associated this variety with his *L. macrocarpa* (*L. contigua*), and subsp. *cinerea*, considering it a link between subsp. *crustulata* and *convexa*. The concrete paraphyses and smaller spores place it under *L. crustulata*.

Hab. On arenaceous and calcareous rocks in upland situations.—*Distr.* Only a few localities in central England, Scotland, and Ireland.—*B. M.* Red Screes, Staveley, Mardale and Kentmere, Westmorland; Bradgate Park, Leicestershire; Willingale Doe; and near Maldon, Essex; Crianlarich, Perthshire; near Carradale, Argyll; Doughruagh Mt., Connemara, Galway.

150. *L. sympathetica* Tayl. ex Leight. Lich. Fl. 257 (1871).—Thallus pale-brown or creamy-white, subdeterminate, tartareous, plane, rimose-areolate, furfuraceous. Apothecia black, numerous, small, subinnate, rugose, marginate; hypothecium thick, black or brownish-black; paraphyses indistinct yellowish-brown at the tips; the epithecium brown; spores ellipsoid, 10–12 μ long, 5–6 μ thick.—Leight. *op. cit.* ed. 3, 249.

Leighton gives the thalline reactions as K + yellow, CaCl + yellow, but when the test was applied to the type at Kew, there was no colour produced. Differs from the preceding in the constantly smaller spores. Not unlike *L. fuscorubens*, but distinguished from that species by the dark-brown hypothecium and the darker tips of the paraphyses.

Hab. On sandstone.—*Distr.* Doubtfully reported from various districts.—*B. M.* Doughruagh, Connemara, Galway.

151. *L. confluens* Ach. Meth. 40 (1803) pro parte.—Thallus determinate or subeffuse, thickish, faintly cracked-areolate, opaque, smoky-white or bluish-grey (K —, CaCl —, medulla I + blue or violet); hypothallus black. Apothecia moderate in size or somewhat large, scattered or crowded and often confluent, appressed or adnate, plane and marginate, becoming convex and immarginate, black; hypothecium brownish-black; paraphyses slender, greenish or dark-olive-brown at the apices; spores ellipsoid, rather small, 9–15 μ long, 5–7 μ thick; hymenial gelatine deep blue with iodine.—S. F. Gray Nat. Arr. i. 464 pro

parte; Hook. in Sm. Engl. Fl. 175; Tayl. in Mackay Fl. Hib. ii. 118 pro parte; Cromb. Lich. Brit. 80 (excl. var.); Leight. Lich. Fl. 295; ed. 3, 303-4 (incl. forms *lævigata* and *rimoso-areolata*). *L. contigua* var. *confluens* Mudd Man. 210 (1861) pro parte. *Lichen confluens* Weber Spicil. Fl. Goett. 180, t. 2 (1778); With. Arr. ed. 3, iv. 8 (excl. vars.); Engl. Bot. t. 1964.

Exsicc. Cromb. n. 182; Johns. nos. 382, 383, 384.

Differs from *L. contigua* in the frequently confluent apothecia, the chemical reaction of the medulla, and the much smaller spores. Where the apothecia are complicate by excessive lateral pressure and reticulate from the combined prominent margins it is f. *complicata* Leight. (Lich. Fl. ed. 3, 304), represented in the British Museum by two specimens from Cader Idris, Merioneth, and from Morrone, Braemar, Aberdeenshire. In f. *steriza* Leight. (l. c.) the thallus is evanescent; in f. *minor* Leight. (l. c.) the apothecia are minute, plane or convex, and more or less confluent.

Hab. On rocks and stone walls.—*Distr.* Common in mountainous districts, rare in S. England.—*B. M.* Near St. Austell, Cornwall; Ardingly Rocks and Arundel, Sussex; Ulting, Essex; Cader Idris; Merioneth; Snowdon, Carnarvonshire; Teesdale and near Darlington; Durham; Kentmere, Westmorland; Ennerdale, Cumberland; Gullane Links, Haddington; West Water, Fife; Sidlaw Hills and Baldovan, Forfarshire; Ben Chalun, Ben More, Ben Lawers, Cairn Gowar, Blair Athole and near Killin, Perthshire; Achosragan Hill, Appin, Argyll; Ben Nevis, Inverness-shire; Morrone, Braemar, Aberdeenshire.

Form **oxydata** Leight. Lich. Fl. ed. 3, 304.—Thallus rusty-red or yellowish. Apothecia confluent or scattered.

Exsicc. Johns. n. 385.

Hab. On rocks.—*Distr.* Somewhat rare in mountainous districts.—*B. M.* Beddgelert, Merioneth; Herdhouse Fell, Cumberland; Achosragan Hill, Appin, Argyll; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire.

152. **L. cinerascens** A. L. Sm.—Thallus determinate or subeffuse, cracked-areolate, whitish or glaucous-white (K —, CaCl —; medulla I + bluish); hypothallus whitish, at times limiting the thallus. Apothecia submoderate, at first innate, plane, with whitish-suffused pseudothalline margin, at length convex, prominent and immarginate, black, naked or slightly pruinose; hypothecium thick, blackish; paraphyses slender, confluent, dark-brown at the apices; spores ellipsoid, 10-15 μ long, 5-7 μ thick; hymenial gelatine deep-blue with iodine.—*Lecidea speirea* Ach. Meth. 52 (1803); in Vet. Ak. Handl. 1808, 263; Cromb. in Grevillea xii. 57. *L. contigua* var. *speirea* Cromb. Lich. Brit. 80. *Lichen speireus* Ach. Prodr. 59 (1798). *Lichen cinerascens* With. Arr. ed. 3, iv. 8 (1796); Cromb. in Grevillea xii. 57 (1883).

Exsicc. Bohl. n. 121 pl.; Johns. n. 386.

Distinct from the preceding in the whitish hypothallus and in the pseudo-lecanorine apothecia, which are usually scattered and solitary

though at times subconfluent. Koerber (Syst. Lich. Germ. 221 (1855)) made this lichen the type of a new genus as *Porpidia trullissata*.

Hab. On rocks, schistose and calcareous, in mountainous regions.—*Distr.* In N. England, the Highlands of Scotland, and W. Ireland.—*B. M.* Skegges Water, Staveley Head and Borrowdale, Westmorland; Alston, Cumberland; Achosragan Hill, Appin, Argyll; Craig Calliach, Ben Lawers, Killin, and Craig Tulloch, Blair Athole, Perthshire; Canlochan, Forfarshire; Morrone, Braemar, Aberdeenshire; Ballagh-beama Gap, Kerry; Kylesmore, Connemara, Galway.

153. *L. Mooreana* Carroll in Nat. Hist. Rev. vi. 529 (1859).—Thallus effuse, thin, greenish-yellow or brown, greyish-white when dry (K + y then reddish). Apothecia moderate in size, black, sessile, solitary or aggregate into little groups, plane, somewhat rough, the margin thin, entire; hypothecium dark-brown; paraphyses slender, discrete, brownish: the whole hymenium gelatinous; spores ovate, 7–10 μ long, 8 μ thick (or possibly 20 $\mu \times 8 \mu$)?; hymenial gelatine yellow-brown with iodine.—Mudd Man. 207; Cromb. Lich. Brit. 82; Leight. Lich. Fl. 275; ed. 3, 275.

There is only a small specimen of this lichen from Carroll in the herbarium. The paraphyses are very slender and numerous, the asci long and rather narrow and spores absent or badly developed. They seem to be the larger size.

Hab.—On rocks.—*B. M.* Crow Glen, Belfast (the only locality).

154. *L. promiscens* Nyl. in Flora lv. 358 (1872).—Thallus effuse, very thin, cracked-areolate, whitish (K —, CaCl —, I + dark-violet), often evanescent. Apothecia adnate, moderate, plane, thinly margined, at length slightly convex and immarginate, black; hypothecium brown; paraphyses slender, clavate, coherent, bluish-black at the apices; the hymenium more or less dark-bluish; the hypothecium partly, the hymenium and epithecium rose-coloured with NO₃; spores oblong, 8–14 μ long, 3–4 μ thick; hymenial gelatine deep-blue, asci at length wine-red, with iodine.—Cromb. in Journ. Bot. xxii. 275 (1882).

In the two British specimens, which are well fertile, the thallus is almost obsolete. It might readily be taken for an crustaceous state of *L. lapicida*, but differs in the thinner spores. Its nearest ally is *L. promiscua* Nyl., a plant of the Pyrenees, where this species also was originally detected. The spermogones are not unfrequent with spermatia straight, 9–14 μ long, 5–6 μ thick. *Lecidea inops* Th. Fr. (Lich. Scand. 501, 1874) is evidently a synonym, the blue colour of the hymenium, very evident in our specimen, is noted by Fries.

Hab.—On a quartzose boulder in a subalpine situation.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

155. *L. declinascens* Nyl. in Flora lxi. 243 (1878).—Thallus ash-grey, deeply cracked-areolate, the areolæ contiguous. Apothecia black, at first plane and marginate, often confluent,

turgid and immarginate; hypothecium brownish to dark-brown; paraphyses slender, non-septate, dark bluish-green at the tips; spores ellipsoid oblong, 10–16 μ long, 5–6 μ thick; hymenial gelatine blue or violet-blue with iodine.

This lichen was determined for Martindale by Nylander, who considered that it differed from his *L. declinans* chiefly in the non-septate character of the paraphyses. In the specimens from the Martindale herbarium, the thallus is a dull ash-grey, rather thick, and gives no reaction with potash. The non-septate character of the paraphyses is doubtful, as they are densely packed and in some instances are certainly septate.

Hab. On rocks in upland regions (Tyrol, Hungary and the Pyrenees).—*B. M.* Red Screes and Cross Fell, Westmorland.

156. *L. silacea* Ach. Meth. 48 (1803).—Thallus areolate, the areolæ convex, tumid, smooth, dark-grey then mostly bright ferruginous or ochraceous-red (K —, CaCl —; medulla I + blue). Apothecia violet-black, numerous, scattered or crowded, varying in size, closely adnate on or between the areolæ, plane or convex with an entire or flexuose margin; hypothecium dark-brownish, the base of the asci often greenish-blue; paraphyses distinct, greenish-blue-black at the tips; spores roundish-oblong, rather small, 10–12 μ long, 5–6 μ thick (sometimes smaller).—Leight. Lich. Fl. ed. 3, 288. *L. lapicida* var. *silacea* Mudd Man. 209 (1861) (excl. syn.); Cromb. Lich. Brit. 81; Leight. Lich. Fl. 285? *Patellaria silacea* Hoffm. Pl. Lich. i. 89, t. 19. f. 2 (1790)? *Lichen silaceus* Ach. Lich. Suec. Prodr. 66 (1798).

The tumid convex areolæ and the dark hypothecium separate this species, as now understood, from the ferruginous-ochraceous forms of *L. lithophila*. It is impossible to be sure of the citations from older authors, as their descriptions are often imperfect. *Lichen silaceus* (Engl. Bot. t. 1118) is probably *L. lithophila* f. *ochracea*, under which it has been quoted.

Hab. On rocks.—*Distr.* Somewhat rare in mountainous districts.—*B. M.* Sidlaw Hills and Glen Fender, Perthshire; Bridge of Gairn, Ballater and Glen Callater, Braemar, Aberdeenshire.

157. *L. Dicksonii* Ach. Meth. 55 (1803).—Thallus thin, plane and smooth, finely cracked-areolate, rusty or yellowish-red, with a thin black hypothallus (K —, CaCl —). Apothecia small, innate, becoming superficial, the disc concave, black, with a prominent black rim and a very indistinct outer reddish covering or pseudothalline margin; hypothecium dark-brown; paraphyses coherent, slender, straight or flexuose, septate, bluish- or brownish-black at the tips; spores ellipsoid, 11–14 μ long, 6–8 μ thick; hymenial gelatine blue with iodine.—*L. Oederi* Wahlenb. Fl. Lapp. 474 (1812) (non. Ach.); S. F. Gray Nat. Arr. i. 465; Hook. Fl. Scot. ii. 38 and in Sm. Engl. Fl. v. 178; Tayl. in Mackay Fl. Hib. ii. 122.—*L. melanophæa* Fr. in Vet. Akad. Handl. 1822, 259; Mudd Man. 206. *Lichen cæsius* Dicks. Pl.

Crypt. fasc. ii. 19 t. 6, fig. 6 (1790)? (non Hoffm.). *L. Dicksonii* Ach. Lich. Succ. Prodr. 76 (1798). With. Arr. ed. 3, iv. 20. *L. Oederi* With. op. cit. ii. (1796) pro parte (non Web.); Sm. Engl. Bot. t. 1117. *Lecanora Dicksonii* Nyl. ex Carroll in Journ. Bot. iv. 255 (1867); Cromb. Lich. Brit. 55 and Monogr. i. 476; Leight. Lich. Fl. 211; ed. 3, 196; A. L. Sm. Monogr. i. 329 (1918).

Exsicc. Cromb. n. 72; Dicks. Hort. Sicc. fasc. ii. n. 24 (as *Lichen Oederi*); Johns. n. 149; Leight. n. 127.

Of doubtful systematic position, but having more affinity with *Lecidea* than with *Lecanora*. The apothecia take rise within the thallus and gradually emerge without association with the gonidia: they are numerous and sometimes confluent, giving a composite lined or dotted disc. The rusty colour is fairly constant, but, as in some other lichens, has generally been considered to be due to the infiltration of ferric hydrate, though, as has been pointed out by Wheldon and Wilson (Lich. Perth. 42), the species sometimes grows on white quartz, where it exhibits the same bright colour. Specimens from Kerguelen Land with a grey thallus have been recorded by Crombie as *Lecidea sincerula* Nyl. (Linn. Soc. Journ. (Bot.) 190 (1877)). The species has been confused with *Rhizocarpon Oederi*, but it differs in the prominent proper margin of the apothecium as well as in spore characters.

Hab. On rocks and walls chiefly schistose, in upland or mountainous regions.—*Distr.* Not uncommon in hilly districts of the British Isles.—*B. M.* Fingle Bridge near Chagford, Devon; Barmouth, Dolgelly and Rhiwgreiddon, Merioneth; Bettws-y-Coed, Denbighshire; Cwm Trefayn, Snowdon, Carnarvonshire; Anglesea; Wrekin Hill, Shropshire; Egglesstone, Durham; Staveley, Kendal, Westmorland; Lamplugh and Ennerdale, Cumberland; Ben Lawers and Craig Tulloch, Blair Athole, Perthshire; Glen Callater and Morrone, Braemar, Aberdeenshire; Applecross, Rossshire; Croghane (? Cloghane) and Mangerton, Killarney, Kerry.

158. *L. lactea* Floerke ex Schær. Spicil. 127 (1812).—Thallus whitish, light brownish-yellow or ashy-grey, thin, smooth, cracked-areolate, the areolæ plane (K + yellow, then deep orange-red); hypothallus black, at times limiting the thallus. Apothecia numerous, scattered or often aggregate in groups or lines, innate, plane, naked or slightly pruinose, with a prominent entire or flexuose margin; hypothecium dark-brown; paraphyses distinct, somewhat clavate and greenish-black at the apices; spores ellipsoid, 12–15 μ long, 5–7 μ thick; hymenial gelatine bluish with iodine.—Cromb. Lich. Brit. 83; Leight. Lich. Fl. 289; ed. 3, 295. *L. ambigua* Fr. Lich. Succ. Exs. n. 407; Stenh. Sched. Crit. xiv. 11 (1833) (non Ach.); Mudd Man. 206 pro parte.

Exsicc. Johns. n. 351; Leight. n. 301.

The smooth thallus and innate apothecia with prominent margin, in which it bears some resemblance to *L. Dicksonii*, give a distinct character to this species. The apothecia are sometimes immersed and the surrounding thallus broken away (f. *circumscissa* Cromb. ms.).

Hab. On rocks in maritime and mountainous districts.—*Distr.* Rather rare throughout the British Isles.—*B. M.* Aberedw, Radnorshire; Cader Idris, Dolgelly and Barmouth, Merioneth; Trefriw and Capel Curig, Carnarvonshire; Cwm Ffynon, Flint; near Thirsk, Yorkshire; Reston Scar, Langdale and Red Screes, Westmorland; Borrowdale and Bowness Knott, Cumberland; Canlochan, Forfarshire; Portlethen, Kincardine; Achosragan Hill, Appin, Argyll; Ben Lawers, Perthshire; Glen Dee and Morrone, Braemar, Aberdeenshire; Mangerton, Kerry.

159. *L. tephrizans* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 237, t. 32, figs. 3 & 4 (1878).—Thallus almost obsolete, only a few whitish depressed scattered areolæ remaining (K —, CaCl —); hypothallus predominating, blackish-grey. Apothecia black, numerous, prominent, sessile, plane or slightly concave, at first marginate; hypothecium thick, blackish-brown; paraphyses distinct but coherent, bluish-black at the tips, the blue colour penetrating downwards through the narrow hymenium; spores ellipsoid, minute, 9–10 μ long, 5 μ thick; hymenial gelatine dull-blue with iodine; spermatia minute, shortly cylindrical, straight.—Leight. Lich. Fl. ed. 3, 311.

Specimens from Pembroke and from Ireland have been examined. Leighton describes the hypothecium as subtended by a greyish-blue excipulum. I have not been able to verify this.

Hab. On hard slaty rock.—*Distr.* Rare in Wales and W. Ireland.

160. *L. sublatypea* Leight. Lich. Fl. 271 (1871); ed. 3, 271.—Thallus effuse or subdeterminate, subareolate or unequally granular and scattered, greyish-white or -brown (K —, CaCl —), with a black hypothallus visible at intervals and giving the whole lichen a dark appearance. Apothecia small, sessile, concave, blackish, with a thickish somewhat shining occasionally flexuose margin; hypothecium blackish brown; paraphyses indistinct, dark bluish-black at the tips; spores ellipsoid, small, 10–12 μ long, 4–6 μ thick; hymenial gelatine deep blue with iodine.—Cromb. in Journ. Bot. ix. 178 (1871). *L. latypodes* Nyl. in Flora lv. 356 (1872); Cromb. in Journ. Bot. xi. 134 (1873).

Exsicc. Cromb. n. 88.

Externally resembling *L. latypea* though with a thinner darker thallus and with smaller spores. Weddell has classified this lichen as a synonym of *Lecidea vorticosa* Koerb. (Mém. Soc. Sci. Nat. Cherb. xix. 283 (1875)), but the dark thallus and smaller apothecia give it a different aspect, though the internal characters of the apothecia agree; the auriculate irregular outline of the apothecia given as characteristic of *L. vorticosa* by Th. Fr. (Lich. Scand. 515) appears also in *L. sublatypea*.

Hab. On schistose rocks.—*Distr.* Somewhat rare in mountainous regions of Wales and Scotland.—*B. M.* Llyn Aran, Cader Idris, Merioneth; Glen Fender and Craig Tulloch, Blair Athole and Ben Lawers, Perthshire; Achosragan Hill, Argyll; Glen Callater, Braemar, Aberdeenshire.

161. *L. asema* Nyl. in Flora lv. 356 (1872).—Thallus effuse, thin, granulate, somewhat scattered, whitish or brownish (K —, CaCl —). Apothecia small, plane, often subplicate, thinly margined, black or dull-black; hypothecium reddish, or reddish-brown; paraphyses confluent; epithecium greyish-blue; spores ellipsoid, 13–16 μ long, 6–8 μ thick; hymenial gelatine bluish then tawny-wine-coloured with iodine.—Cromb. in Journ. Bot. xi. 134 (1873); Leight. Lich. Fl. ed. 3, 275.

Closely allied to *L. sublatypea* but differing in the internal characters of the apothecia.

Hab. On arenaceous and schistose rocks in maritime districts.—*Distr.* Found only sparingly in the Channel Islands and the S.W. Highlands of Scotland.—*B.M.* Barcaldine, Argyll.

162. *L. depareula* Nyl. in Flora lv. 361 (1872).—Thallus scattered, thin, subareolate, greyish, at times nearly evanescent with a black hypothallus only here and there visible (K —, CaCl —). Apothecia small, slightly prominent, somewhat difform and subumbonate in the centre, marginate, black, the margin obtuse and turgid, at times suberenate; hypothecium brownish-black; paraphyses dark bluish-green towards the apices; spores ellipsoid, small, 9–12 μ long, 5–7 μ thick; hymenial gelatine blue or dark-blue with iodine.—Cromb. in Grevillea i. 62; Leight. Lich. Fl. ed. 3, 311.

Reported only from Scotland. It differs from *L. sublatypea* in the less developed thallus and hypothallus and in the irregularly formed apothecia.

Hab. On rocks in Alpine localities.—*Distr.* Local and rare on the Grampians, Scotland.—*B.M.* Summit of Ben-y-Gloe, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire.

163. *L. dealbatula* Nyl. in Flora lvii. 315 (1874).—Thallus whitish, rather thin, contiguous and cracked-areolate or the areolae scattered (K —, CaCl —). Apothecia minute, somewhat prominent on the whitish thallus, thinly margined, umbonate or at length subgyrose in the centre, black; hypothecium dark-brown; paraphyses moderate, coherent, brown at the apices; spores ellipsoid, 10–12 μ long, 6–8 μ thick; hymenial gelatine deep-blue with iodine.—Cromb. in Grevillea iii. 23; Leight. Lich. Fl. ed. 3, 287.

In the specimens seen the apothecia are dispersed and not very numerous. The scattered areolae give often a sprinkled appearance to the thallus.

Hab. On schistose rocks in mountainous regions.—*Distr.* Sparingly in N. Wales, the S. Grampians, Scotland, and N.W. Ireland.—*B.M.* Cader Idris, Merioneth; Trefriw, Denbighshire; Stronachlachan, Ben Lawers, Killin and Loch-na-gat, Perthshire; Doughruagh Mt., Connemara, Galway.

164. **L. tabidula** Nyl. in Flora lxii. 357 (1879).—Thallus effuse, scattered, thin or very thin, unequal, blackish (K —, CaCl —). Apothecia minute, plane, slightly margined, often aggregate, black; hypothecium and perithecium dark-brown (or reddish-brown in thin section); paraphyses not well discrete, the epithecium sordid-bluish-black; spores ellipsoid, 11–16 μ long, 6–7 μ thick; hymenial gelatine bluish then tawny-wine-coloured with iodine.—Cromb. in Grevillea viii. 112.

The thallus is but little visible and appears only in the immediate vicinity of the fructifications which generally occur in scattered small groups. It is near to *L. deparcula* but differs in the larger spores and other characters. Spermogones are here and there present with slightly arcuate spermatia 12–14 μ long, .5 μ thick, though their identity with the species, as in other instances, is uncertain.

Hab. On quartzose stones in an alpine situation.—*B. M.* Summit of Ben-y-gloe, Blair Athole, Perthshire (the only record).

165. **L. polyantha** Tayl. ex Leight. Lich. Fl. ed. 3, 252 (1879).—Thallus yellowish-brown, tartareous, thin, plane, rimulose, areolate, (K + yellow, CaCl + orange-yellow). Apothecia black, small, sessile, with a prominent entire margin; hypothecium thick, reddish-brown; paraphyses distinct, pale at the tips; spores ellipsoid, 11–12 μ long, 7 μ thick (or smaller); hymenial gelatine blue, the asci brown, with iodine.

On examination of the type specimen at Kew it was found that the epithecium was blue-green or faintly blackish, the paraphyses slender and very lax.

Hab. On sandstone.—*Distr.* Rare in S. England and Wales.

166. **L. contiguella** Nyl. in Flora lvi. 295 (1873).—Thallus determinate, thinly areolate-rimose, whitish (K —, CaCl —, medulla I —); hypothallus black, limiting the thallus. Apothecia moderate, adnate, plane, marginate, black; hypothecium dark-brown; paraphyses slender, almost distinct; epithecium bluish-black; spores oblong, 11–15 μ long, 4.5–5.5 μ thick; hymenial gelatine bluish then wine-reddish with iodine.—Cromb. in Grevillea ii. 90 (1873); Leight. Lich. Fl. ed. 3, 296.

Resembles *L. lactea* Floerke, but is distinguished by the absence of any thalline reactions. The apothecia are often crowded and angulose, with the margin more or less flexuose. The spermogones, rarely present in the specimens gathered, have the spermatia bacillar, about 7 μ long, 1 μ thick.

Hab. On a felspathic boulder in an alpine locality.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

167. **L. auriculata** Th. Fr. Lich. Arct. 213 (1860).—Thallus whitish, ashy-grey or brownish, cracked-areolate sometimes evanescent (K —, CaCl —). Apothecia appressed or adnate, at first plane then more or less convex, with the centre somewhat

depressed-umbilicate, margin usually persistent, flexuose, becoming sinuate-lobate; hypothecium thick, sordid-brown; paraphyses loosely coherent, clavate and dark-brown or greenish-blue-black at the apices; asci somewhat scarce; spores ellipsoid-oblong, small, 6–11 μ long, 2.5–3.5 μ thick; hymenial gelatine deep-blue with iodine.—*L. sarcogyniza* Nyl. in Flora li. 475 (1868). Cromb. in Journ. Bot. vii. 106 (1869) & Lich Brit. 82; Leight. Lich. Fl. 289; ed. 3, 312. *L. phylliscocarpa* Nyl. in Flora lvii. 314 (1874); Cromb. in Grevillea iii. 23; Leight. Lich. Fl. ed. 3, 312.

Distinguished by the irregular lobate apothecia which sometimes leave shallow pits in the substratum more or less white-farinose (I —) at the base. The thallus is occasionally brownish-yellow (f. *subochracea* Cromb. ms.).

Hab. On rocks in maritime and mountainous regions.—*Distr.* Somewhat plentiful on the Grampians and on the east coast of Scotland.—*B. M.* Glen Fender and Craig Tulloch, Blair Athole, Ben Lawers, Ben-y-Gloe, and Ben Vraekie, Perthshire; near Portlethen, Kincardine; Hill of Ardo and Morrone, Braemar, Aberdeenshire; Ben Cruachan, Argyll; Ben Nevis and Glen Nevis, Inverness-shire; Slievemore, Achill Island, Mayo.

Var. *diducens* Th. Fr. Lich. Scand. 499 (1874).—Thallus evanescent. Apothecia scattered or usually aggregate.—*L. diducens* Nyl. in Flora xlviii. 148 (1865); Cromb. Lich. Brit. 85; Leight. Lich. Fl. 298; ed. 3, 309. *L. confederans* Nyl. in Flora lvi. 296 (1873); Cromb. in Grevillea ii. 91 (1873); Leight. Lich. Fl. ed. 3, 312.

Occasionally 20 or 30 small apothecia are conglomerate; the isolated apothecia are larger and have a thicker margin.

Exsicc. Larb. Lich. Cæsar. n. 39.

Hab. On granitic rocks in maritime and mountainous regions.—*Distr.* Somewhat rare in the Channel Islands, W. Ireland, and the N. of Scotland.—*B. M.* Le Fret, Noirmont, Jersey; Ben Lawers, Ben Vraekie, and Ben-y-gloe, Perthshire; Morrone, Braemar, Aberdeenshire; Sands of Culbin, Morayshire.

168. *L. sarcogynoides* Koerb. Syst. Lich. Germ. 252 (1855).—Thallus greyish, effuse or absent. Apothecia black, scattered or crowded and aggregate and then difform, closely adnate, plane with a prominent flexuose margin; hypothecium thicker, blackish-brown, hymenium narrow, bluish-grey; paraphyses thick, conglutinate, black at the apices; spores minute, ellipsoid-elongate.—Cromb. in Journ. Bot. xii. 149 (1874); Leight. Lich. Fl. ed. 3, 313.

A doubtful species. There is one specimen in the British Museum, collected and named by Larbalestier. The hymenium is bluish-grey with a pinkish tinge, especially in a thick section. The spores are undeveloped; their measurements are nowhere recorded.

Hab. On rocks.—*B. M.* La Moye, Jersey.

169. *L. umbonella* Nyl. in Flora xlix. 372 (1866).—Thallus determinate, in small roundish patches, areolate, smooth, whitish or pale-yellowish (K + yellow, then reddish, CaCl —). Apothecia small, innate, margined, usually subgyrose or umbonate in the centre, black; paraphyses rather slender, brownish-black at the tips; epithecium nearly colourless; hypothecium brown or brownish (the perithecium and umbo brownish-black in thin section); spores ellipsoid, 11–14 μ long, 6–8 μ thick; hymenial gelatine bluish with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. 332 (1867); Cromb. Lich. Brit. 85; Leight. Lich. Fl. 297; ed. 3, 305.

Not unlike *L. lactea* but with a raised patchy thallus and minute gyrose apothecia. These, at length slightly prominent, are usually numerous on the thalline patches. The spermogones, solitary or congregate and somewhat prominent, are frequent, with spermatia cylindrical, straight, 6–7 μ long, scarcely 1 μ thick.

Hab. On schistose rocks in mountainous regions.—*Distr.* Rare on the Scottish Grampians.—*B. M.* Ben More, Perthshire; Cairn Turc, Braemar, Aberdeenshire.

170. *L. illita* Nyl. in Flora lxii. 356 (1879).—Thallus effuse, thin or very thin, applanate, cracked-areolate, the areolæ angulose, yellowish-brown or pale-greyish (K(CaCl) + reddish, medulla CaCl + reddish); hypothallus very thin, umbrine-black. Apothecia minute, innate, margined, umbonate in the centre, black; paraphyses slender, scanty; perithecium and umbo brownish-black in thin section; hypothecium thin, almost colourless; spores ellipsoid, 12–16 μ long, 8–11 μ thick; hymenial gelatine tawny-wine-reddish with iodine.—Cromb. in Grevillea viii. 112. Specimen not seen.

Differs from the preceding in the thalline reaction. Apothecia 1 or 2 in each thalline areola; the spermogones have the spermatia acicular, 5–6 μ long, .5 μ thick, on simple, moderate sterigmata. It has been detected at Mozi in Japan (*vide* Nyl. Lich. Jap. 75), with larger spores, 14–20 μ long, 9–13 μ thick.

Hab. On argillaceous rock at Clifton, Gloucestershire.

171. *L. alumnula* Nyl. in Flora lix. 574 (1876).—Thallus determinate, thin, white (K —, CaCl —); hypothallus black, limiting the thallus. Apothecia minute, subinnate, plane, margined, often subumbonate in the centre, black; paraphyses concrete, brownish-black at the apices; hypothecium brownish-black; spores ellipsoid, 9–12 μ long, 5–6 μ thick; hymenial gelatine bluish, the asci at length pale-wine-coloured with iodine.—Cromb. in Grevillea v. 107; Leight. Lich. Fl. ed. 3, 302.

Frequently grows in sublobulate patches on the thallus of *contigua*. Our specimens are well fertile, with the apothecia at times subconfluent.

Hab. On quartzose rocks of a stream in an upland district.—*B. M.* Base of Diamond Mt. and Letterfrack, Connemara, Galway (the only locality).

172. *L. limborina* A. L. Sm.—Thallus thin or obsolete, effuse, blackish or greyish, slightly rimulose. Apothecia small, black, adnate or appressed, centrally umbonate or tuberculate, the margin tumid, incurved and uneven; hypothecium dull-brown; paraphyses indistinct, becoming black and carbonaceous at the tips; spores ellipsoid, colourless, becoming brown, 18–30 μ long, 11–16 μ thick or smaller.—*L. trochodes* Cromb. Lich. Brit. 94 (1870); Leight. Lich. Fl. 257; ed. 3, 250 & in Grevillea iv. 2 t. 52, figs. e–g. *Opegrapha saxigena* var. *trochodes* Taylor ex Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 93. Pl. 5, figs. a, b (1854). *Rimularia limborina* Nyl. in Flora li. 346 (1868); Cromb. Lich. Brit. 106; Leight. Lich. Fl. 406; ed. 3, 438.

A puzzling and rare species distinguished by the large brown simple spores, for which reason it was placed by Nylander in a separate genus, *Rimularia*. The name *trochodes* originated with Taylor in ms.; he had labelled a specimen of this lichen, collected in Carig Mt., Kerry, *Opegrapha saxigena* var. *trochodes*. By an error Leighton and Crombie have quoted this name as if published by Taylor under *O. saxigena* in Mackay Fl. Hib. ii. 259 (1836).

Hab. On rocks. Rare in the N. Grampians of Scotland and in S.W. Ireland.—*B. M.* Craig Guie, Braemar, Aberdeenshire; Dunkerron, Kerry.

173. *L. subgyratula* Nyl. in Flora lvi. 296 (1873).—Thallus thin and discontinuous, dark-brown or blackish, opaque, faintly cracked. Apothecia black, small, tuberculate or gyrose; hypothecium blackish; paraphyses slender, not distinct; epithecium brownish; spores ellipsoid, 16 μ long, 9 μ thick; hymenial gelatine pale-blue then tawny-wine-red with iodine.—Leight. in Grevillea iv. 26, t. 52, figs a, b, & Lich. Fl. ed. 3, 250.

Differs from the preceding in the more tuberculate apothecia and in the smaller colourless spores.

Hab. On granitic rocks.—*B. M.* Summit of Morrone, Braemar, Aberdeenshire (the only locality).

174. *L. aglæa* Sommerf. Suppl. Fl. Lapp. 144 (1826); Nyl. Lich. Scand. 228.—Thallus indeterminate, thickish, warted-areolate, the areolæ tumid, convex somewhat shining, yellowish (K + yellow, CaCl —, K(CaCl + yellow); hypothallus black. Apothecia adnate, moderate, convex, immarginate, somewhat shining, black; hypothecium pallid or mostly dull-brown; paraphyses coherent, dark-greenish at the apices; epithecium brownish or bluish-black; spores ellipsoid-oblong, 10–16 μ long, 6–8 μ thick; hymenial gelatine deep-blue, the asci at length often sordid-violet, with iodine.—Cromb. in Journ. Bot. viii. 99 (1870); Leight.

Lich. Fl. 275; ed. 3, 278. *L. areolata* Carroll in Journ. Bot. iv. 24 (1866) (non Schær.); Cromb. Lich. Brit. 82; Leight. Lich. Fl. 276; ed. 3, 279. *Lichen miscellus* Sm. Engl. Bot. t. 1831 (1808) (non Ach.).

Exsicc. Johns. n. 508.

Allied to *L. fuscoatra*, differing chiefly in the more massive thallus, and in the thalline reactions. The areolæ, at length somewhat rugose, are either crowded or more or less scattered, in which latter case the hypothallus is more visible. Sometimes the thallus is very thick (f. *incrassata* Cromb.). The apothecia, usually numerous, are only in a young state very thickly margined; at times they are crowded, more convex, confluent and difform (f. *confluens* Cromb. ms.). The very common spermatogones have the spermatia straight, oblong, 6–9 μ long, 1.5 μ thick. I follow Leighton's suggestion in including the plant referred by Carroll to *L. areolata* Schær.; there is no specimen in the British Museum.

Hab. On rocks and boulders, granitic and schistose, in mountainous regions.—*Distr.* Not uncommon in N. Wales and among the Grampians, Scotland; rare in N. England and W. Ireland.—*B. M.* Cader Idris and Moel Gader, Dolgelly, Merioneth; Twll Du, Nant Francon, Carnedd Dafydd, Trefriw, and Llyn Geirionydd, Carnarvonshire; near Winch Bridge, Teesdale, Durham; Gilgarron, Cumberland; Ben Cruachan, Argyll; Killin, Ben Lawers, Craig Tulloch, Craig Calliach and Ben Vrackie, Perthshire; Glen Callater, Braemar, Aberdeenshire; Kylesmore, Connemara, Galway.

Form Crombiei Nyl. in Flora liii. 38 (1870).—Thallus sulphur-yellow or whitish-yellow. Apothecia innate, somewhat convex; spores 10–12 μ long, 6–7 μ thick.—Cromb. in Grevillea i. 173. *L. Crombiei* Jones ex Nyl. in Flora li. 345 (1868); Cromb. in Journ. Bot. vii. 49 (1869), & Lich. Brit. 82.

Differs only in the colour of the thallus (which, however, becomes darker in the herbarium), in the constantly innate apothecia and the rather smaller spores.

Hab. On rocks, granitic and schistose, in mountainous districts.—*Distr.* Only a few localities in N. Wales, the Grampians, Scotland, and W. Ireland.—*B. M.* Dolgelly, Merioneth; Ben Lawers, Craig Tulloch, Blair Athole, Perthshire; The Khoil, Glen Callater, and Morrone, Braemar, Aberdeenshire; Mangerton, Killarney, Kerry; Doughruagh Mt., Connemara, Galway.

175. L. armeniaca Fr. Syst. Orb. Veg. i. 286 (1825); Schær. Spicil. 126, 193.—Thallus subdeterminate, thick or thickish, cracked-areolate, the areolæ plane or somewhat convex, rugose, sometimes imbedded in the rock, yellow-ochraceous or yellowish-red (K + yellow, then red, CaCl —); hypothallus bluish-black. Apothecia innate, moderate, subplane, or often convex, black, immarginate; hypothecium pale or dull-brown; paraphyses concrete, dark-olive-brown at the apices; spores ellipsoid or oblong, 9–13 μ long, 4–6 μ thick; hymenial gelatine deep-blue with iodine.—Cromb. Lich. Brit. 83; Leight. Lich. Fl. 251 pro

parte; ed. 3, 243, pro parte. *Rhizocarpon armeniacum* DC. Fl. Fr. ii. 366 (1805).

Readily distinguished by the turgid brightly coloured thallus and by the thalline reactions. The two varieties, according to Nylander, grow together with intermediate states on the mountains of Dauphiné.

Hab. On siliceous rocks.—*B. M.* Craig-na-Lochan, Breadalbane, Perthshire (specimen from Stirton herbarium).

Var. *aglæoides* Nyl. in Act. Soc. Sci. Fenn. vii. 401 (1863).—Thallus normally yellow or pale-ochroleucous, the areolæ usually rugose. Apothecia convex; spores 9–13 μ long, 4.5–5.5 μ thick.—Cromb. Lich. Brit. 83.

Nylander (in Bull. Soc. Linn. Norm. ser. 2, vi. 278 (1872)) has more recently suggested that this is only a state in which the thallus remains longer of a paler colour, though at length in the herbarium it becomes concolorous with that of the type. In the single British specimen the areolæ are somewhat scattered, with the hypothallus very conspicuous.

Hab. On a granitoid boulder in an alpine situation.—*B. M.* Near the summit of Craig Calliach, Perthshire (the only locality).

Var. *lutescens* Nyl. l. c.—Thallus smoothish, pale-ochroleucous or whitish, subopaque. Apothecia at length superficial, somewhat convex; spores as in the preceding variety.—*Psora spectabilis* var. *lutescens* Anzi Cat. Lich. Sondr. 66 (1860).

Characterized by the paler thallus which apparently does not become reddish in the herbarium. Nylander says that it often has the aspect of *L. marginata* Schær., but differs from that in the internal colour of the apothecia. The single British specimen is well fertile, both apothecia and spermogones being frequent.

Hab. On a schistose rock in an alpine locality.—*B. M.* Near the summit of Ben Lawers, Perthshire.

176. *L. fuscoatra* Ach. Meth. 44 (1803) pro parte.—Thallus determinate, areolate, the areolæ plane or slightly convex, brown, chestnut-brown or copper-coloured, somewhat shining (K —, CaCl + reddish, medulla I —); hypothallus black, usually limiting the thallus. Apothecia moderate in size, black, appressed, at first plane and thinly margined, becoming often convex and immarginate; hypothecium dark-brown; paraphyses coherent, blackish at the apices; spores ellipsoid, or oblong-ellipsoid, 10–16 μ long, 5–7 μ thick; hymenial gelatine bluish then violet-wine-coloured with iodine.—Hook. Fl. Scot. ii. 37; S. F. Gray Nat. Arr. i. 463; Hook. in Sm. Engl. Fl. 174; Tayl. in Mackay Fl. Hib. ii. 117; Cromb. Lich. Brit. 83; Leight. Lich. Fl. 287; ed. 3, 293; var. *gibba* Wahlenb. Fl. Lapp. 475 (1812); f. *gibba* Leight. l.c.; f. *dendritica* Cromb. Lich. Brit. 83 (1870). *L. famosa* Ach. Meth. 41 (1803); Hook. Fl. Scot. ii. 37; S. F. Gray Nat. Arr. i. 463 (excl. syn.); Mudd Man. 211. *L. cechumena* Ach. Meth. 42 (1803); Hook. in Sm. Engl. Fl. v. 175. *Lichen*

fuscoater L. Sp. Pl. 1140 (1753); Lightf. Fl. Scot. 804; With. Arr. ed. 3, iv. 11. *L. fumosus* Ach. Lich. Suec. Prodr. 78 (1798). *L. dendriticus* Dicks. Pl. Crypt. Fasc. iv. 21 (1801); Engl. Bot. t. 1734 (shows a well-marked radiating hypothallus). *L. cecumenus* Sm. Engl. Bot. t. 1830 (1808). *Verrucaria fumosa* Hoffm. Deutschl. Fl. ii. 190 (1795). *V. dendritica* Hoffm. Pl. Lich. i. 90, t. 19, fig. 4 (1790).

Exsicc. Johns. n. 448; Leight. nos. 215, 216, 239, 240 (pro parte), 304.

Hab. On rocks.—*Distr.* Somewhat frequent in mountainous regions of Wales, N.W. England, Scotland and W. Ireland.—*B. M.* May Hill, and near Cirencester, Gloucestershire; Barmouth and Cader Idris, Merioneth; Malvern and near Droitwich, Worcestershire; Long Mynd, Lyth Hill, and Wrekin Hill, Shropshire; near Llanwrtyd, Breconshire; Dent, Langbaughrigg, near Ayton, Battersby and High Cliff, Cleveland, Yorkshire; Egglestone, Durham; Kentmere, Westmoreland, Keswick, Cumberland; Barcaldine, Argyll; Ben Lawers, Perthshire; Glen Callater, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire.

Form **meiosporiza** Leight. Lich. Fl. ed. 3, 294 (1879).—Thallus whitish or greyish-white, rimose-areolate. Apothecia plane or subconvex, cæcio-pruinose.—*L. grisella* f. *meiosporiza* Nyl. in Flora lix. 239 (1876); Cromb. in Journ. Bot. xiv. 362 (1876).

Exsicc. Johns. n. 352.

Differs merely in the constantly paler thallus and the pruinose apothecia. As the name indicates, it has somewhat the aspect of *L. crustulata* var. *meiospora* Oliv. but with pruinose apothecia.

Hab. On schistose rocks in mountainous districts.—*Distr.* Local and scarce in N. England, the N. Grampians, Scotland and in W. Ireland.—*B. M.* Alston, Cumberland; Morrone, Braemar, Aberdeenshire; near Letterfrack, Connemara, Galway; Clare Island, Mayo.

Var. **grisella** Nyl. Lich. Scand. 230 (1861).—Thalline areolæ contiguous, plane or somewhat convex, angulose, greyish or whitish, opaque. Apothecia moderate, subinnate, plane or slightly convex, black, often slightly pruinose, dark within, the margin entire; spores as in the type.—*Lecidea grisella* Floerke in Flot. Lich. Siles. (1829) nos. 141, 142; Cromb. Lich. Brit. 83. *L. fumosa* var. *grisella* Floerke ex Schær. Enum. 110 (1850); Mudd Man. 212. *L. fuscoatra* f. *grisella* Leight. Lich. Fl. 288; ed. 3, 294. *L. interjecta* Nyl. in Flora xlix. 418 (1866); Cromb. Lich. Brit. 81; Leight. Lich. Fl. 297; ed. 3, 306. *Lichen diacapsis* Sm. Engl. Bot. t. 1954 (1809).

Exsicc. Mudd n. 182 pro parte; Johns. n. 449; Larb. Lich. Hb. n. 145.

Readily distinguished from the species by the much paler, opaque thallus. The numerous though usually somewhat scattered apothecia are rarely somewhat variable; occasionally they are concentrically arranged.

Hab. On rocks and boulders, very rarely on brick walls, from maritime to subalpine tracts. — *Distr.* Here and there in Great Britain; rare in W. Ireland; not found with certainty in the Channel Islands. — *B. M.* Near Hastings, Sussex; Crown Hill, Devon; near Monmouth; Dolgelly, Merioneth; Lyth Hill, Shropshire; Ayton Moor, Cleveland, and Langbaughrigg, Yorkshire; Durham; near Hexham, Northumberland; Black Lot, near Brandon and Pugh Crag, Westmorland; Ennerdale and near Penrith, Cumberland; Achosragan Hill, Appin, Argyll; Ben Lawers, Perthshire; Letter Hill, Connemara, Galway.

Var. Mosigii Nyl. Lich. Scand. 230 (1861). — Thallus chestnut- or greyish-brown, smoothish. Apothecia moderate or somewhat large, innate, plane, thinly margined, pruinose, the margin often flexuose and naked. — *f. Mosigii* Leight. Lich. Fl. 288; ed. 3, 294; *f. deusta* Leight. Lich. Fl. 289; ed. 3, l. c. *L. fumosa* var. *Mosigii* Ach. Lich. Univ. 157 (1810); var. *deusta* Mudd Man. 211 (1861) (non Fries).

Exsicc. Johns. n. 450; Leight. n. 240 pro parte.

Differs chiefly in the pruinose apothecia which are either somewhat scattered or crowded and at times confluent. The thallus is limited by the hypothallus, which is also occasionally more or less visible between the areolæ.

Hab. On granitic and schistose rocks in maritime and mountainous districts. — *Distr.* Only here and there in Great Britain; rare in S. and W. Ireland (Connemara, Galway, *vide* Leight.); not found with certainty in the Channel Islands. — *B. M.* Roughton, Cornwall; N. Derbyshire; Dolgelly, Merioneth; The Wrekin, Shropshire; near Llanwrttyd, Breconshire; near Ayton, Cleveland, Yorkshire; Penrith, Cumberland; Achosragan Hill, Appin, Argyll; Craig Calliach, Perthshire; near Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; near Bantry, Cork.

177. **L. nigrogrisea** Nyl. in Flora lxii. 357 (1879). — Thallus indeterminate, moderate or thinnish, granulate-areolate, greyish; the areolæ subconvex, somewhat shining (K —, (a)Cl —, medulla I —). Apothecia at first plane and thinly margined, then somewhat convex and almost immarginate, black; hypothecium brown; epithecium and perithecium blackish; spores ellipsoid-oblong, 7–11 μ long, 4–5 μ thick; hymenial gelatine bluish, the asci at length tawny-wine-coloured, with iodine. — Cromb. in Grevillea viii. 113.

Distinguished from all states of *L. fuscoatra* by the absence of any thalline reactions and by the smaller spores. In the specimen seen, the apothecia are somewhat crowded. The spermogones, occasionally present, have the spermatia straight, 6–8 μ long, 6 μ thick.

Hab. On a mica-schist wall in an upland district. — *B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

178. **L. macula** Tayl. in Mackay Fl. Hib. ii. 115 (1836); Nyl. in Flora lxii. 361 (1879). — Thallus determinate, thin, areolate-rimose, smooth, the areolæ minute, concave, then somewhat plane,

more or less scattered, pale- or olive-greyish (K —, CaCl —); hypothallus very thin, black. Apothecia minute, innate, plane, margined, black, the margin slightly prominent; hypothecium brown; paraphyses concrete; epithecium bluish-brown; spores minute, oblong-ellipsoid, 6–8 μ long, 3–4 μ thick; hymenial gelatine pale-bluish then tawny with iodine.—Cromb. in Journ. Bot. xx. 275 (1882). *L. perustula* Nyl. l. c. 221; Cromb. in Grevillea viii. 29. *L. nitida* Leight. Lich. Fl. ed. 3, 295, pro parte (non Schær.).

Exsicc. Leight. n. 278 (as *L. fuscoatra* var.).

Resembles a diminutive state of *L. fuscoatra*, but differs in the absence of any thalline reactions and the much smaller spores. The numerous inconspicuous apothecia occasionally have the margins paler. The predominant black hypothallus gives a very dark appearance.

Hab. On siliceous rocks in maritime and mountainous districts.—*Distr.* Only a few localities in Wales and W. Ireland, probably overlooked elsewhere.—*B. M.* Barmouth, Merioneth; Llanberis, Carnarvonshire; Dunkerron, Kerry; Doughruagh Mt., Connemara, Galway.

179. *L. endomelaena* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 239, t. 32, figs. 13 & 14 (1878).—Thallus pale-greyish-green, opaque, granular, the granules large, scattered or aggregate, convex, composed of minute conglomerate convex roundish or sublobate subfurfuraceous squamules (K + pale-yellow, CaCl + pale-yellow). Apothecia violet-black, rather large, innate-sessile, at first plane with a thickish margin, then convex and immarginate, slightly pruinose; hypothecium very thick, brownish-black, with a paler brown stratum below; paraphyses coherent, brown at the apices; spores elongate-cylindrical, small, 11–12 μ long, 4–5 μ thick or rather larger; hymenial gelatine palish-blue-violet with iodine.—Leight. Lich. Fl. ed. 3, 247.

Hab. On stone walls in upland districts.—*B. M.* Moel-y-gest, near Tremadoc, Carnarvonshire.

180. *L. fuliginosa* Tayl. in Mackay Fl. Hib. ii. 131 (1836).—Thallus dark-brown or reddish, granular-squamulose, conglomerate (K —, CaCl —), with a blackish-brown byssoid hypothallus. Apothecia black, small, solitary or aggregate, somewhat convex, with a thin disappearing margin; hypothecium thick, brownish-black; paraphyses coherent, yellowish-brown, and brownish- or bluish-black at the apices; spores ellipsoid, small, 8–10 μ long, 4–6 μ thick; hymenial gelatine, especially the asci, bluish with iodine.—Mudd Man. 208; Cromb. Lich. Brit. 77; Leight. Lich. Fl. 255; ed. 3, 247. *L. confusa* Nyl. Lich. Scand. 216 (1861).

Exsicc. Leight. n. 305.

The thallus is somewhat variable, as the squamulose granules may be either congested or scattered. The hypothallus is mainly composed

of *Stigonema* sp. or other blue-green algae which give a very dark appearance to the plant.

Hab. On siliceous rocks.—*Distr.* Upland or mountainous districts.—*B. M.* Barmouth, Merioneth; Llanbedrog and Llyn Geirionydd, Carnarvon; The Scar and Pugh Crag, Westmorland (as *L. macra*); Glen Fender, Blair Athole, Perthshire; Dunmanway, Cork; Carig Mt., Kerry; Doughruagh Mt., Connemara, Galway.

Var. subconfusa A. L. Sm. Differs from the species in the more finely granular darker grey thallus, in the small innate apothecia and the rather smaller spores ($7-8 \mu \times 3.5 \mu$). As in the species the thallus is intermixed with *Stigonema* sp. &c.—*L. subconfusa* Nyl. in Flora lii. 84 (1869); Cromb. in Grevillea v. 27; Leight. Lich. Fl. ed. 3, 332.

Hab. On siliceous rocks.—*B. M.* Tullywhree Bridge, near Kylemore, Connemara, Galway.

181. *L. fuscocinerea* Nyl. in Bot. Not. 1852, 177.—Thallus effuse, rimose-areolate, unequal, greyish- or blackish-brown, the areolæ often warted and tuberculate (K \mp yellow, CaCl —); hypothallus blackish. Apothecia moderate in size, appressed or adnate, black, somewhat plane, with thin prominent margin, usually thinly gyrose, variously flexuose or angulose; hypothecium brownish-black; paraphyses slender, concrete, dark-brown at the clavate apices; spores broadly ellipsoid, $9-14 \mu$ long, $7-9 \mu$ thick; hymenial gelatine pale-bluish then wine-red with iodine.—Leight. Lich. Fl. ed. 3, 285.

Subsequently referred by Nylander (Lich. Scand. 231) to *L. tenebrosa* Flot. (*L. griseotra*), but it differs from that species in apothecial characters. Most of the apothecia have a wrinkled appearance (gyrose). The spermogones are not unfrequent, the spermatia straight, $7-9 \mu$ long, about 1μ thick.

Hab. On schistose rocks and boulders in mountainous districts.—*Distr.* Sparingly in N. Wales and on the Central Grampians, Scotland.—*B. M.* Ben Lawers and Ben Vrackie, Perthshire.

182. *L. relieta* Stirton in Trans. Glasg. Soc. Field. Nat. 1875, 89.—Thallus greyish-black, wrinkled, almost granular. Apothecia black, small, adnate, plane obtusely marginate, becoming convex, immarginate and rugose; hypothecium brownish-black; paraphyses few, slender, distinct, with clavate brown apices; spores oblong, $9-13 \mu$ long, $5-6 \mu$ thick; hymenial gelatine bluish then wine-red with iodine.—Leight. Lich. Fl. ed. 3, 277.

Hab. On rocks. Collected by Dr. Stirton at Blair Athole, Perthshire.

183. *L. uliginosus* Stirton in Scott. Nat. iv. 164 (1877).—Thallus brownish-black, effuse, minutely granular. Apothecia black, plane or subconvex (internally K + violet); hypothecium

brownish-black; paraphyses few, slender, irregular; spores oblong, $13\ \mu$ long, $6-7\ \mu$ thick; hymenial gelatine pale-blue then dark-wine-red with iodine.—Leight. Lich. Fl. ed. 3, 278.

Hab. On turfy earth. Collected by Dr. Stirton near Garve, Ross-shire.

184. **L. mullensis** Stirton in Scott. Nat. iv. 166 (1877).—Thallus dark or blackish-grey, areolate-warted, cracked, formed of erect columellæ, either connate or dispersed (K + yellow, medulla + yellow then ferruginous-red). Apothecia black, subinnate, small, plane, acutely margined, the margin often flexuose or undulate; hypothecium thickish, brown or brownish-black; paraphyses irregular, indistinct, black at the apices; spores ellipsoid, $6-9\ \mu$ long, $4-6\ \mu$ thick; hymenial gelatine bluish then wine-red with iodine.—Leight. Lich. Fl. ed. 3, 288.

Hab. On rocks.—*B. M.* Ben More, Island of Mull.

185. **L. callista** Stirton in Grevillea iii. 34 (1874).—Thallus dark-brownish-black, granular, the granules dispersed or conglomerate. Apothecia black, small, bluish-grey pruinose, sessile, crowded, often contiguous, the margin prominent, inflexed; hypothecium brownish-black, thin; paraphyses rather indistinct, thickish, clavate, and brown at the apices; spores ellipsoid or cylindrical, small, $12-14\ \mu$ long, $3\ \mu$ thick; hymenial gelatine intensely blue or almost black with iodine.—Leight. Lich. Fl. ed. 3, 276.

Hab. On rocks. Collected by Dr. Stirton near Grantown, Inverness-shire.

186. **L. furvella** Nyl. in Mudd Man. 207 (1861).—Thallus effuse, thickish, granulose-furfuraceous, areolate-diffract, dark-olive-brown or blackish, opaque (K —, CaCl —); hypothallus blackish. Apothecia small, appressed, plane, wrinkled, margined, black, the margin thin, flexuose, persistent; paraphyses coherent, bluish- or brownish-black at the apices; hypothecium dark-brown; spores ellipsoid, $11-16\ \mu$ long, $6-9\ \mu$ thick; hymenial gelatine bluish then wine-red with iodine.—Cromb. Lich. Brit. 84; Leight. Lich. Fl. 272; ed. 3, 272. *L. furvula* Nyl. in Flora xlix. 418 (1866); Cromb. *l. c.*; Leight. *ll. c.*

A well-marked species, having much the appearance of *Pannularia nigra*. The soft somewhat isidioid thallus is loosely adherent to the substratum. The more or less scattered apothecia are usually as if plicate, though here and there quite regular.

Hab. On schistose rocks and walls in mountainous regions.—*Distr.* Local, though not unfrequent where it occurs, among the Grampians, Scotland.—*B. M.* Ben Lawers, Craig Tulloch, Glen Fender and Ben Vrackie, Perthshire; Morrone and Glen Callater, Braemar, Aberdeenshire.

187. *L. subfurva* Nyl. in Flora lv. 360 (1872).—Thallus indeterminate minutely furfuraceous and deeply cracked-areolate, brownish-black or greyish-brown (K —, CaCl —); hypothallus black, scarcely visible. Apothecia small, plane, thin wrinkled, often angulose with a thin persistent margin, brownish-black; hypothecium dark-brown; paraphyses indistinct, irregularly coherent, the epithecium dark-greenish blue, the colour penetrating downwards; spores broadly ellipsoid, 11–12 μ long, 9 μ thick; hymenial gelatine deep-blue with iodine.—Cromb. in Grevillea i. 61; Leight. Lich. Fl. ed. 3, 250.

The thallus resembles that of *L. furvella*, but it differs in the smaller spores and in the colour of the epithecium. In some of the specimens examined the paraphyses are brown upwards. The thallus spreads extensively, but the apothecia are few and mostly developed towards the centre.

Hab. On micaceous rocks and walls in upland situations.—*Distr.* Local though plentiful where it occurs among the Central Grampians, Scotland.—*B. M.* Craig Tulloch and Glen Fender, Blair Athole, by Loch Earn and Ben Lawers, Perthshire.

188. *L. insularis* Nyl. in Bot. Not. 1852, 177.—Thallus determinate, verrucose-unequal, areolate-diffract, moderately thick; the areolæ verrucose-plicate, somewhat shining, brownish-grey or tawny-brown (K + yellow, CaCl —); hypothallus blackish. Apothecia small, appressed, plane, black, margined, the margin thin, prominent, flexuose; hypothecium brownish-black; paraphyses concrete, dark-brown at the apices; spores ellipsoid, 10–12 μ long, 5–6 μ thick; hymenial gelatine bluish then sordid-violet with iodine.—*L. intumescens* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 373 (1856); Mudd Man. 205, t. 3, f. 76; Cromb. Lich. Brit. 85; Leight. Lich. Fl. 254; ed. 3, 246. *L. badia* var. *intumescens* Flot. Lich. Siles. n. 175 (1830).

Exsicc. Leight. n. 161; Mudd n. 174.

Distinguished by the manner and place of growth. With us it always forms small, orbicular, insulated patches on the thallus of *Lecanora* (*glaucoma*) *sordida*, usually limited by the hypothallus. As noted by Mudd, though not strictly a parasite, it at length destroys the thallus of the plant upon which it grows. In the specimens seen the apothecia are numerous and crowded.

Hab. On rocks in maritime and upland hilly districts.—*Distr.* Only here and there sparingly in Great Britain; not seen from Ireland or the Channel Islands.—*B. M.* Malvern Hills, Worcestershire; Gimlet Rock, Pwllheli, and Snowden, Carnarvonshire; Caer Caradoc, Shropshire; Lounsdale and Cliffrigg, Cleveland, Yorkshire; near Portlethen, Kincardineshire.

189. *L. submoestula* Nyl. in Flora lix. 235 (1876).—Thallus effuse, minutely granular, crowded or subdispersed, brownish-grey (K —, CaCl —). Apothecia small, convex, immarginate, black, often several connate; hypothecium thick, dark-reddish-brown;

paraphyses indistinct, the epithecium greenish-black, the colour penetrating into the narrow hymenium; spores ellipsoid, small, 6–10 μ long, 3.5 μ thick; hymenial gelatine bluish then tawny-wine-coloured with iodine.—Cromb. in Grevillea v. 26; Leight. Lich. Fl. ed. 3, 268.

Considered by Nylander to be near to *L. moestula*, but the epithecial colouring indicates the sect. *Eulecidea*.

The specimens from Ireland are overrun by a blue-green alga (*Stigonema* sp.). In the Cornwall specimen (from Hb. Martindale) determined by E. W. Holmes, there is no alga present and the scattered granules have flattened and developed into small scattered whitish-grey areolæ.

Hab. On dry arenaceous rocks in maritime districts.—*B. M.* Grayley, Cornwall; road to Westport, Kylemore, Connemara, Galway.

190. *L. alienata* Nyl. in Flora lxii. 362 (1879).—Thallus effuse, somewhat granular or leprose, unequal, thin, scattered, greyish-yellow (Kf + yellowish, K(CaCl) + pale-tawny-reddish). Apothecia minute, prominent, thinly margined, glomerulose-connate, black; hypothecium blackish; paraphyses moderate, pale-bluish at the apices; spores ellipsoid, 12–15 μ long, 7–8 μ thick; hymenial gelatine scarcely tinged, but the asci bluish then tawny with iodine.—*Lithographa Larbalestierii* Leight. Lich. Fl. ed. 3, 394 (1879).

Exsicc. Larb. Lich. Hb. n. 153.

From its graphideine aspect referred by Leighton to *Lithographa*. The fructification constitutes irregular, scattered glomerules, each of which is composed of 12 or more apothecia. The gonidia are either simple or subglomerulose. Spermogones not seen.

Hab. On moist schistose rocks.—*B. M.* Kylemore Lake, Galway.

191. *L. advertens* Nyl. in Flora xlix. 419 (1866).—Thallus indeterminate, thin, subfurfuraceous, byssoid, olive-black (K —, CaCl —). Apothecia minute, at length somewhat convex and immarginate, black; paraphyses concrete; hypothecium black or brownish-black; epithecium sordid-bluish; spores ellipsoid, 11–14 μ long, 7–9 μ thick; hymenial gelatine bluish with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. 408 (1867) & Lich. Fl. 255; ed. 3, 251; Cromb. Lich. Brit. 86.

Associated with blue-green algæ, and has the aspect externally of *Spilonema revertens*.

Hab. On calcareous rocks in maritime and subalpine tracts.—*Distr.* Found only in Wales and N.W. Ireland.—*B. M.* Giltar Point, Tenby, Pembrokeshire.

192. *L. segregans* Nyl. in Flora xlix. 372 (1866).—Thallus indeterminate, verrucose-granular, whitish or greyish-white, the granules more or less segregate, or here and there confluent; hypothallus blackish, usually little visible. Apothecia small,

subplane, immarginate, at length convex, often aggregate-confluent and then rather small, black; hypothecium brown; paraphyses not well discrete, spores oblong, 10–13 μ long, 3·5–4·5 μ thick; hymenial gelatine pale-bluish then tawny-wine-coloured with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. 332 (1867) & Lich. Fl. 282; ed. 3, 286; Cromb. Lich. Brit. 92. Specimen not seen.

Nylander places this near *L. melancheima* Tuck.; its position is, however, uncertain.

Hab. On a mica-schist rock.—*Distr.* Ben Lawers, Perthshire.

193. *L. neglecta* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iv. 233 (1859) & Lich. Scand. 244.—Thallus subdeterminate, thinly granulose, greyish-white or leaden-greyish, the granules minute, subconfluent in patches (K + yellow, CaCl—). Apothecia minute, superficial, somewhat plane, black, opaque, the margin obtuse, at length evanescent; paraphyses dark-brownish at the apices; hypothecium brownish or dark; spores oblong or fusiform-oblong, 8–11 μ long, 3–4 μ thick; hymenial gelatine not tinged or only sordid-yellow with iodine.—Cromb. in Journ. Bot. xiii. 141 (1875); Leight. Lich. Fl. ed. 3, 276.

Exsicc. Cromb. n. 189.

A very distinct and rather peculiar species, which in a sterile condition might readily be taken for a rudimentary condition of a *Stereocaulon*. The thallus, normally orbicular, becomes, through the confluence of several, more or less effuse. Apothecia rare.

Hab. Incrusting mosses (species of *Grimmia* and *Andreaea*) on boulders in subalpine districts.—*Distr.* Local and scarce on the S. Grampians, Scotland, and in N. England.—*B. M.* Ben Lawers, Perthshire.

194. *L. obsoleta* Nyl. in Flora xlviii. 604 (1865).—Thallus not visible. Apothecia minute, opaque, black, concolorous within, the margin obtuse or indistinct; paraphyses discrete, the apices subelavate, thickened, nearly colourless; hypothecium sordid-brownish; spores oblong, sometimes obsoletely septate, 9–11 μ long, 3 μ thick; hymenial gelatine scarcely tinged with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, xvii. 350 (1866) & Lich. Fl. 299; ed. 3, 309; Cromb. Lich. Brit. 92. Specimen not seen.

Differs from the preceding in the absence of a proper thallus and in the character of the paraphyses.

Hab. On cretaceous soil in an upland situation.—*Distr.* The Downs, near Lewes, Sussex.

195. *L. pedatula* Nyl. in Flora lix. 236 (1876).—Thallus effuse, thin, granulose, whitish (K + yellow). Apothecia minute, somewhat convex, stipitate, immarginate, black; hymenium in thin section bluish, the epithecium darker; hypothecium stipitiform, reddish; spores not seen fully developed; hymenial

gelatine slightly bluish with iodine.—Cromb. in Grevillea v. 28 (1876); Leight. Lich. Fl. ed. 3, 276. Specimen not seen.

Considered by Nylander as allied to *L. neglecta*.

Hab. On rocks, overspreading *Stigonema saxicolum*.—*Distr.* Extremely local and rare, known only from a single specimen (Connemara, Galway).

196. *L. sylvicola* Flot. Lich. Siles. n. 171 (1830); Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 185 (1866).—Thallus effuse, thin, rimulose, wrinkled or somewhat furfuraceous, pale-tawny-yellow or dull-greyish (K —, CaCl —). Apothecia small, black, convex, immarginate, sometimes becoming two or more connate and tuberculate; hypothecium thick, blackish-brown or violet-black; paraphyses concrete, the base and towards the tips deep-greenish-blue or sometimes brownish, the whole hymenium bluish; spores ellipsoid, small, 7–10 μ long, 3.5–4.5 μ thick; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. 69; Leight. Lich. Fl. 256; ed. 3, 248. *L. latens* Tayl. in Mackay Fl. Hib. ii. 259 (1836).

Exsicc. Larb. Lich. Hb. n. 304 & Lich. Cæsar. n. 84.

In more exposed situations the thallus is somewhat variable in thickness and becomes darker in colour. The spermogones are wart-like with slender straight spermatia, 4–5 μ long, about 1 μ thick.

Hab. On shady rocks, granitic and schistose, in maritime and upland situations.—*Distr.* Rather local and scarce in the Channel Islands, W. England, S.E. and W. Ireland, and central Scotland.—*B. M.* St. Peter's Valley, Jersey; Moulin Bay, Sark; Cobo Bay, Guernsey; near Penzance, Cornwall; Belton, Rutland; Holly Bush Hill, Malvern, Worcestershire; Barmouth, Merioneth; Battersby Bank, Cleveland, Yorkshire; Dunkeld, Perthshire; The Dargle, Wicklow; Kylemore, Connemara, Galway.

Var. *Hellbomii* Leight. Lich. Fl. ed. 3, 249 (1879).—Thallus dark-greyish-brown. Apothecia globose-tuberculate, conglomerate, and spores somewhat smaller, 5–7 μ long, 3–4 μ thick (or 10 $\mu \times$ 5–6 μ), otherwise as in the species.—*Lecidea Hellbomii* Lahm in Flora liii. 177 (1870). *L. aggerata* Mudd Man. 208 (1861); Cromb. Lich. Brit. 77. *L. contigua* f. *aggerata* Leight. Lich. Fl. 294 (1871); ed. 3, 301.

Exsicc. Johns. n. 434; Mudd n. 175.

Differs in the form of the somewhat scattered conglomerate apothecia, which resemble minute bramble fruits.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Seen only from the Channel Islands, N. Wales and N. England.—*B. M.* Sark; Battersby Bank, Cleveland, Yorkshire; Axwell Park, Durham.

197. *L. aphanoides* Nyl. in Flora li. 476 (1868).—Thallus indeterminate, thin, subverrucose or subgranulose, unequal, dark-olive-grey. Apothecia small, convex, immarginate, naked, black; hypothecium slightly reddish beneath; paraphyses concrete;

epithecium and hymenium dark-greenish-blue; spores ellipsoid, $9-13\ \mu$ long, $4.5-5.5\ \mu$ thick; hymenial gelatine bluish then violet-red with iodine.—Cromb. in Journ. Bot. vii. 107 (1869) & Lich. Brit. 84; Leight. Lich. Fl. 267; ed. 3, 265.

In the single known specimen the apothecia are numerous and approximate, though not crowded.

Hab. On a boulder in a subalpine locality.—*B. M.* Near the summit of Craig Guie, Braemar, Aberdeenshire (the only locality).

198. *L. melaphana* Nyl. in Flora lii. 83 (1869).—Thallus subeffuse, thin, opaque, somewhat diffract, unequal, blackish (K —, CaCl —). Apothecia small, convex, immarginate, black; paraphyses somewhat lax, slightly clavate; epithecium (and the hymenium above) bluish-green; hypothecium thickish, brown beneath; spores oblong, $11-19\ \mu$ long, $4.5-5.5\ \mu$ thick; hymenial gelatine bluish then partly violet-coloured with iodine.—Cromb. in Journ. Bot. vii. 107 (1869) & Lich. Brit. 84; Leight. Lich. Fl. 297; ed. 3, 306.

Intimately related to *L. aphanoides*, from which it is distinguished by the darker colour of the hypothecium and by the longer spores. The single specimen, which is only sparingly fertile, was associated with *Lecanora smaragdula* f. *sinopica* and with *Lecidea contigua* var. *flavicunda*, the latter of which it partially overruns.

Hab. On a granitic boulder in upland tracts of mountainous districts.—*B. M.* Ben Lawers, Perthshire; Craig Guie, Braemar, Aberdeenshire.

199. *L. expansa* Nyl. ex Mudd Man. 208 (1861).—Thallus effuse, thin, furfuraceous, continuous or rimulose, black or sordid-greyish (K —, CaCl —). Apothecia minute, sessile, plane, margined, black, the margin thin, smooth; hypothecium dark-brown; paraphyses concrete, blackish-brown at the apices; spores ellipsoid, minute, $7-10\ \mu$ long, $3.5-4\ \mu$ thick; hymenial gelatine bluish with iodine.—*L. dispansa* Nyl. in Flora xlix. 87 (1866); Cromb. Lich. Brit. 84; Leight. Lich. Fl. 256; ed. 3, 248.

Ersicc. Leight. n. 186; Mudd n. 176; Larb. Lich. Hb. n. 222.

The thallus when black and little developed forms ink-like stains on the substratum. The apothecia, though very numerous, are scattered and solitary. The very minute spermogones are frequent, with cylindrical or subellipsoid spermatia, $3-4\ \mu$ long, $1.5\ \mu$ thick.

Hab. On rocks and flint stones in maritime and upland situations. *Distr.* Only here and there in England and Wales, Ireland and the Channel Islands; not seen from Scotland.—*B. M.* Rozel, Jersey; Lydd Beach, Kent; Langford, Essex; Blue Anchor, Somerset; Thetford, Norfolk; Bewdley, Worcestershire; Stiperstones, Shropshire; near Battersby and Roseberry, Cleveland, Yorkshire; Teesdale, Durham; Glencorbot, Connemara, Galway.

Subsp. *demarginata* Nyl. in Flora lxi. 245 (1878).—Thallus very thin, subleprose, whitish or greyish. Apothecia convex,

the margin indistinct, otherwise as in the species.—*L. demarginata* Cromb. in Grevillea vii. 97; Leight. Lich. Fl. ed. 3, 248.

In the single specimen seen, which is well fertile, the thallus is partly subochraceous.

Hab. On schistose rocks in a maritime district.—*B. M.* Salrock Road, near Kylemore, Connemara, Galway (the only locality).

200. *L. enclitica* Nyl. in Flora xlix. 369 (1866) & in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 148 (1866).—Thallus scarcely visible, evanescent or obsolete. Apothecia minute, convex, immarginate, black; hypothecium brown; paraphyses concrete; epithecium vaguely blackish; spores oblong, 8–14 μ long, 3–4 μ thick; hymenial gelatine bluish then sordid-wine-coloured with iodine.—Cromb. in Journ. Bot. ix. 178 (1871); Leight. Lich. Fl. 301; ed. 3, 311.

Resembles externally *Biatorina globulosa*, for an athalline state of which it might readily be taken, but is well distinguished by the colour of the apothecia internally and of the hypothecium, and also by the simple somewhat thicker spores. In one of the two British specimens there are faint traces of a greyish-white thallus. The apothecia are distantly scattered over the substratum, so that the plant is apt to be overlooked.

Hab. On old fir palings in a subalpine district.—*Distr.* Found only very sparingly among the central Grampians, Scotland.—*B. M.* Pass of Killiecrankie and Glen Fender, Blair Athole, Perthshire.

201. *L. xanthococca* Sommerf. Suppl. Fl. Lapp. 154 (1826); Nyl. Lich. Scand. 243.—Thallus effuse, thinnish, granulose or verrucose, the granules often more or less scattered, convex or somewhat depressed, straw-coloured or pale-yellow (K + yellow-ochraceous, CaCl —). Apothecia small, adnate or appressed, plane, often scabrid, margined, black, the margin thin, at times flexuose; hypothecium black; paraphyses slender, blackish at the apices, the epithecium K + purplish; spores ellipsoid, 8–10 μ long, 4–5 μ thick; hymenial gelatine, especially the asci, deep-blue with iodine.

The thallus, as noted by Th. Fries (Lich. Scand. 517), is at first immersed and scattered, then erumpent, soft, with the verrucæ either crowded and variously angulose or thin, granulose and scattered, while at times it is subevanescent. The single British specimen is well fertile, though the thallus is for the most part but little developed. The spermatogones are large, black, subglobose and variously corrugate, with spermatia shortly cylindrical, about 3 μ long.

Hab. On the stump of an old fir tree in a wooded mountainous region.—*B. M.* Ballochbuie Forest, Braemar, Aberdeenshire.

202. *L. pycnocarpa* Koerb. Parerg. Lich. 213 (1861).—Thallus warted or warted-areolate whitish or dark-ashy-grey; hypothallus indistinct (K + yellow, CaCl —). Apothecia minute,

black, somewhat convex, immarginate, dispersed or conglomerate in dense orbicular groups; hypothecium dark-brown; paraphyses coherent, dark-brown towards the apices; spores linear-oblong, 12–17 μ long, 3–6 μ thick; hymenial gelatine and asci blue then wine-red with iodine.—*L. symphorella* Nyl. in Flora lxiii. 35 (1870); Cromb. in Journ. Bot. viii. 99 (1870); Leight. Lich. Fl. 301: ed. 3, 286. *L. amphotera* Leight. ex Cromb. in Journ. Bot. ix. 179 (1871) & Lich. Fl. 283; ed. 3, 287.

Exsicc. Cromb. n. 89.

Hab. On granitic and sandstone rocks.—*Distr.* Rare in mountainous places, N. Scotland.—*B. M.* Dan Hill, Westmorland; Ben Lawers, Craig Tulloch, Ben-y-Gloe, Blair Athole, Perthshire; Canlochan, Forfarshire; Morrone, Braemar and Hill of Ardo, Aberdeenshire; Sligo Mountains.

203. *L. commaculans* Nyl. in Flora li. 476 (1868).—Thallus effuse, thin, opaque, subareolate, the areolæ scattered, depressed, greyish-or brownish-black (K—, CaCl—). Apothecia submoderate, slightly convex, scarcely margined, black; hypothecium thickish, reddish-brown, the colour passing into the hymenium; paraphyses concrete; epithecium blackish; spores oblong, 8–11 μ long, 3–4 μ thick; hymenial gelatine bluish with iodine.—Cromb. in Journ. Bot. vii. 106 (1869) & Lich. Brit. 93; Leight. Lich. Fl. 282; ed. 3, 287.

Considered by Nylander to approach *L. kajanita* (Lich. Scand. 245), a Scandinavian plant, but differs in the form of the spores and especially in the colour of the hypothecium. From *L. expansa* Nyl. it is separated by the hypothecium and also by the larger immarginate apothecia. The spermatogones here and there visible have the spermatia cylindrical, straight, 9–11 μ long, 1 μ thick.

Hab. On a felspathic boulder, and quartzose stones in an alpine situation.—*B. M.* Summit of Morrone, Braemar, Aberdeenshire.

PARASITIC ON OTHER LICHENS, OFTEN CLASSIFIED WITH FUNGI.

204. *L. vitellinaria* Nyl. in Bot. Not. 1852, 177.—Thallus absent. Apothecia sessile, minute, concave, at length plane, margined black, the margin slightly prominent, shining; hypothecium thin brownish; paraphyses conglutinate, greenish-black at the apices; spores ellipsoid with a thick outer wall, 10–12 μ long, 6 μ thick; hymenial gelatine bluish then violet with iodine.—Mudd Man. 212, t. 3, f. 77; Cromb. Lich. Brit. 78; Leight. Lich. Fl. 355; ed. 3, 384.

Exsicc. Leight. n. 182.

In structure the apothecia are very similar to *Lecidea parasema* (Nyl. Lich. Scand. 218). Recently it has been classified by Rehm as a fungus under *Nesolechia* (Rabenh. Krypt. Fl. iii. 319 (1896)).

Hab. Parasitic on the thallus of *Candelariella vitellina*; recorded more rarely on *Lecidea lactea*. On rocks in upland situations.—*Distr.*

Only a few localities in W. and N. England and Central Scotland.—*B. M.* Lyth Hill and Haughmond Hill, Shropshire; Malvern, Worcestershire, near Newton and Battersby, Cleveland, Yorkshire; near Ben Lawers, Perthshire.

205. *L. oxyspora* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 391 (1856).—Apothecia minute, plane or slightly convex, black or brownish-black, immarginate; hypothecium brownish; paraphyses concrete; spores ellipsoid-fusiform, 14–20 μ long, 5–7 μ thick; hymenial gelatine, especially the asci, bluish with iodine.—Cromb. Lich. Brit. 92; Leight. Lich. Fl. 357; ed. 3, 384. *Abrothallus oxysporus* Tul. in Ann. Sci. Nat. sér. 3, xvii. 116, t. 16, fig. 27 (1852); Lindsay in Microscop. Journ. v. t. 4, ff. 15, 16; Mudd Man. 225. *Nesolechia oxyspora* Massal. Miss. Lich. 43 (1856).

Exsicc. Leight. n. 281.

Hab. Parasitic on various *Parmeliæ*—e. g. *P. saxatilis* f. *furfuracea*, *P. conspersa* var. *stenophylla*, *P. fuliginosa*, in maritime and upland districts.—*Distr.* Rather local in S.W. England, Wales, the Highlands of Scotland, and S.W. Ireland; not seen from the Channel Islands.—*B. M.* Near Launceston, Cornwall; near Abergavenny, Monmouthshire; Barmouth and Dolgelly, Merioneth; Barcaldine and Appin, Argyll; Craig Calliach, Pass of Leny and Dunkeld, Perthshire; Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; Dunkerron, Kerry.

206. *L. cladoniaria* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 339 (1857).—Thallus absent. Apothecia minute, opaque, subconvex, slightly prominent, rugulose, black, internally dark or concolorous; paraphyses moderate; hypothecium slightly blackish beneath; spores oblong, 10 μ long, 3.5 μ thick; hymenial gelatine bluish then sordid with iodine.—Cromb. Lich. Brit. 94; Leight. Lich. Fl. 358; ed. 3, 388. *Nesolechia cladoniaria* Arn. in Flora lvii. 99 (1874). Specimen not seen.

In this country the apothecia are known to occur only on the thallus of *Cladonia bellidiflora*, though they were originally detected on that of *Cladonia uncialis*; in both cases they give the host a deformed and verrucose-rugose aspect.

Hab. Parasitic on *Cladonia bellidiflora* in an upland situation.—*Distr.* Kelly's Glen, near Dublin.

207. *L. imponens* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 238, t. 32, figs. 7 & 8 (1876).—Thallus obsolete. Apothecia black, minute, numerous, scattered, plane or subconcave, the thin margin disappearing; hypothecium colourless or pale-bluish-grey; paraphyses stout, coherent, blackish at the apices; spores ellipsoid, 14–15 μ long, 5.5 μ thick.—Leight. Lich. Fl. ed. 3, 385.

Hab. Parasitic on the thallus of *Lecanora polytropa*.—*B. M.* Fort Hill, near Fishguard, Pembrokeshire (the only locality).

208. *L. epiphorbia* Stirton in Grevillea ii. 108 (1873).—"Apothecia resemble externally and internally those of *L.*

(*Buellia*) *parmeliarum*, except that the paraphyses are neither thickened nor darker-coloured at their apices. The spores are colourless, or present, in a few instances, a faint tinge of yellow, and the reaction on the hymenial gelatine by means of iodine shows a deep vinous red without any preceding cœrulescent tints, instead of being negative as in *L. parmeliarum*. This lichen bears the same relationship to *L. parmeliarum* that *L. solorinaria* does to *L. oxyspora*."—Leight. Lich. Fl. ed. 3, 388. Specimen not seen.

Crombie (Journ. Bot. xii. 148 (1874)) suggests that this may be *Biatorina Wallrothii*, but this is denied by Stirton (Grevillea iii. 25).

Hab. Parasitic on *Solorina bispora*. Collected by Dr. Stirton on Ben Lawers, Perthshire.

209. *L. insita* Stirton in Scott. Nat. 1879, 17.—Thallus none. Apothecia black, small, convex, immarginate, generally nearly spherical, internally rufescent; hypothecium reddish or reddish-black; paraphyses distinct, slender, filiform, reddish or almost colourless at the apices; spores 12–16 in the somewhat clavate ascus, spherical; hymenial gelatine intense-blue then deep-wine-red with iodine.—Leight. Lich. Fl. ed. 3, 545. Evidently allied, as Stirton suggests, to *L. geophana*.

Hab. Parasitic on *Peltigera aphthosa*. Collected by Dr. Stirton at Craig-na-Lochan, Scotland.

§ iv. MYCOBLASTUS Th. Fr. Lich. Scand. 479 (1874); Norm. in Nyt. Mag. Nat. vii. 250 (1852) as genus. (Pl. 7.)

Thallus crustaceous. Spores usually 1, rarely 2 or 3 in the ascus; spermatogones with simple sterigmata and straight spermatia. *Mycoblastus* is frequently classified as a genus.

210. *L. sanguinaria* Ach. Meth. 39 (1803) & Lich. Univ. 170.—Thallus effuse, moderate or thickish, granulose-unequal or granulose-concreescent, greyish-white or whitish (K + yellow, CaCl —); medulla blood-red beneath the apothecia (K + crimson). Apothecia adnate, moderate or somewhat large, convex, immarginate, black, greyish within; paraphyses concrete, dark-bluish at the apices; hypothecium thin, pale or slightly dark; spores solitary, very large, with a broad episporium, 70–100 μ long, 28–38 μ thick; hymenial gelatine, especially the asci, deep-blue with iodine.—Hook. Fl. Scot. ii. 37; S. F. Gray Nat. Arr. i. 464; Hook. in Sm. Engl. Fl. v. 177; Tayl. in Mackay Fl. Hib. ii. 120; Cromb. Lich. Brit. 93; Leight. Lich. Fl. 265; ed. 3, 262. *Lichen sanguinari* L. Sp. Pl. 1140 (1753) (excl. syn. Dill.); Huds. Fl. Angl. 442 pro parte; Lightf. Fl. Scot. ii. 803 pro parte; Engl. Bot. t. 155; With. Arr. ed. 3, iv. 6. *Megalospora sanguinaria* Massal. Ric. Lich. 106, fig. 211 (1852); Mudd Man. 213, t. 4, f. 79.

Exsicc. Bohl. n. 46; Leight. n. 307; Mudd n. 184; Cromb. n. 94.

Easily recognized by the blood-red colour of the medulla under the apothecia which at times is also visible elsewhere in the thallus, in which case it is form *polyerythrina* Nyl. ex Th. Fries Lich. Scand. 480. The thallus varies somewhat in thickness according to the nature of the substratum, and when muscicolous is usually rather thin. The apothecia are numerous, scattered or crowded, sometimes confluent and difform; in our specimens a few occasionally appear as if crowned by the well-developed thallus, showing a transition to var. *lecanoroidea* Nyl. Lich. Jap. 77. The not unfrequent spermogones are very minute, punctiform, black, with spermatia shortly acicular, 6–9 μ long, 1 μ thick. The quotation from Dillenius cited by Linnæus refers to *L. parasema* (fide Cromb. in Journ. Linn. Soc. (Bot.) xvii. 563 (1880)).

Hab. On rocks, trunks of old trees, chiefly firs, rarely on old palings or encrusting mosses on boulders in hilly and mountainous districts.—*Distr.* Not uncommon in central and N. England, plentiful in Wales and the Highlands of Scotland; apparently rare in E. and S.W. Ireland.—*B. M.* Charnwood Forest, Leicestershire; Hay Park, Herefordshire; Cromford Moor, near Matlock, and Black Edge, near Buxton, Derbyshire; Cader Idris and Nannau, near Dolgelly and Barmouth, Merioneth; Carnedd Dafydd, Carnarvonshire; Craigforda, Shropshire; Ingleby Park, Cleveland, Yorkshire; Windermere, Westmorland; Bassenthwaite, Cumberland; Teesdale, Durham; Hedgehope, Northumberland; Roseneath, Dumbartonshire; Inverary and Head of Loch Awe, Argyll; Aberfeldy, Glen Falloch, Killin, Ben Lawers, Black Wood of Rannoch, Craig Vinean and Craig-y-Barns, Dunkeld, Perthshire; Clova, Forfarshire; Hill of Ardo, near Aberdeen, Linn of Dee; Craig Coinnoch, Morrone, Glen Quoich and near the foot of Ben Macdhui, Aberdeenshire; Glen Nevis and Rothiemurchus Woods, Invernessshire; Lairg, Sutherland; Dublin Mts.; Tore Mt., Killarney, Kerry.

Form *microcarpa* Nyl. Lich. Scand. 246, fig. 10 (1861).—Thallus thin, granulose-subconcretescent. Apothecia small; spores 58–72 μ long, 24–30 μ thick.

Differs in the smaller apothecia and spores. In the single British specimen, which is sparingly fertile, a few of the confluent apothecia are erratic on the sterile thallus of *Cladonia coccifera*.

Hab. Incrusting mosses on boulders in a subalpine locality.—*B. M.* Craig Calliach, Perthshire.

Var. *affinis* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 127 (1857).—Thallus and apothecia as in the species; medulla not coloured.—Leight. Lich. Fl. ed. 3, 263. *L. affinis* Schær. Enum. 132 (1850); Cromb. in Journ. Bot. xii. 149 (1874).

Nylander rightly considers this only a variety, the absence of colour in the medulla being the only distinguishing character.

Hab. On decayed mosses on the ground in an alpine locality.—*B. M.* Morrone, Braemar, Aberdeenshire.

Var. *melina* Nyl. in Ann. Sci. Nat. ser. 4, xix. 357 (1863).—Thallus thinnish, medulla colourless. Apothecia small; spores 2 in the ascus, 52–64 μ long, 34–44 μ thick.—Leight. Lich. Fl. ed. 3, 263. *L. didymospora* Stirton in Grevillea ii. 60 (1873).

L. affinis var. *melina* Cromb. in Journ. Bot. xii. 149 (1874). *Lichenoides tartareum tinctorium candidum, tuberculis atris* Dill. Hist. Musc. 128 t. 18, fig. 8 (1741). *Megalospora melina* Krempelh. ex Nyl. *l. c.*

Closely related to the preceding, of which, but for the 2-spored asci and the smaller spores, it might be regarded as only a form (see Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 166 (1866)).

Hab. On the trunks of firs in mountainous districts.—*Distr.* Very local and rare in N. Wales and the S. Grampians, Scotland.—*B. M.* Cader Idris, Merioneth; Glyder, Carnarvonshire; Ben Lawers, Perthshire.

Var. *endorhoda* Th. Fr. Lich. Scand. 479 (1874).—The thallus similar to the species, but within continuously, or here and there, reddish.—Subsp. *subsanguinaria* Stirton in Scott. Nat. v. 218 (1880). A.L.Sm. Monogr. Brit. Lich. i. 471 (1918).

Stirton based his subspecies on the presence of the red colouring in the thallus apart from the apothecia, a character already noted by Th. Fries (*tom. cit.* 480). Stirton states that there is no reaction with K, but that is a variable character.

Hab. On bark.—*B. M.* Kinloch Rannoch, Perthshire.

211. *L. fucata* Stirton in Scott. Nat. 1879, 16.—Thallus cinereous, granulose or evanescent. Apothecia black, round or oblong or somewhat irregular, convex and immarginate internally, entirely of an intense-violet colour, scarcely changed by iodine (K + blue-greenish); hypothecium colourless; paraphyses distinct, thickish, irregular; spores 1-3 in the ascus, ellipsoid or oblong-ellipsoid, the epispore thick and pellucid, 32-48 μ long, 15-22 μ thick.—Leight. Lich. Fl. ed. 3, 545.

The beautiful violet colour of the thecium internally is very pronounced. The spores have a tendency to become brown, probably by degeneration.

Hab. On decorticated wood in an upland district.—*B. M.* Near Tyndrum, Perthshire.

74. **BIATORELLA** De Not. in Giorn. Bot. Ital. ii. 192 (1846); Massal. Ric. Lich. 130 (1852) emend. (Pl. 8.)

Thallus crustaceous, effuse or definite, rarely almost obsolete. Algal cells Protococcaceae. Apothecia light-coloured or dark and carbonaceous, with proper margin only; asci many-spored, the spores minute, simple, colourless, oblong or spherical. Spermatogones with ovoid or shortly cylindrical spermatia.

By a printer's error, which is pointed out by Massalongo, *l. c.*, the genus was published as 8-spored instead of ∞ -spored, and was confined to lichens with a thin leprose thallus. It was emended by Massalongo to include also those with a more developed thallus, and further emended by Th. Fries (Gen. Heterolich. 86 (1861) & Lich. Scand. 396). Both

these writers, as also Mudd (Man. 191), include one or more of the species placed by Crombie in the section *Sarcogyne* of *Lecanora* (Part i. ed. 1, 487). Zahlbruckner (Engl. & Prantl, Pflanzenfamilien i. 1, 151) places the genus in the Order *Acarosporaceæ*, along with other genera, either lecanorine or lecideine, that have similar many-spored asci and minute colourless spores.

The 16-spored *Lecidea geophana* (L. *pleiospora* A. L. Sm.) is included under *Lecidea* Sect. *Biatora*.

Apothecia soft, often brightly coloured § i. EUBIATORELLA (1-8).

Apothecia dark and carbonaceous § ii. SARCOGYNE (9-14).

§ i. EUBIATORELLA Th. Fr. Lich. Scand. 397 (1874).—Thallus evident or indistinct. Apothecia mostly soft and rather pale within (biatorine).

(a) Spores oblong.

1. **B. fossarum** Th. Fr. Lich. Scand. 397 (1874).—Thallus effuse, very thin, granulose or leprose, greyish or greenish (K —, CaCl —), at times evanescent. Apothecia moderate or somewhat large, adnate or appressed, convex, immarginate, reddish-flesh-coloured or bright saffron-red; hypothecium pale; paraphyses discrete, slender, yellow at the apices; spores oblong or oblong-cylindrical, 6-14 μ long, 3-4 μ thick; hymenial gelatine deep-blue then dark with iodine.—*Lecidea fossarum* Duf. in Fr. Lich. Eur. 264 (1831); Leight. Lich. Fl. ed. 3, 383; Cromb. in Grevillea xxii. 59.

Externally subsimilar to *Lecidea vernalis*, but differing in the structure of the apothecia. In the few British specimens seen, the thallus is but little visible, and the apothecia are also smaller and less brightly-coloured than in specimens from southern Europe.

Hab. On mosses amongst rocks in an alpine situation.—*B. M.* Summit of Ben Lawers, Perthshire.

2. **B. campestris** Th. Fr. Gen. Heterolich. 86 (1861) & Lich. Scand. 398.—Thallus scanty, granular greenish. Apothecia small, waxy, scattered, sessile, closed then open, marginate, becoming flat or convex, the margin disappearing, reddish flesh-coloured; hypothecium colourless; paraphyses slender, somewhat bent and widened and scarcely coloured at the tips; asci elongate-clavate, thick-walled, about 90-120 μ long, 15-18 μ thick or longer and narrower; spores many in the ascus, cylindrical, 5-8 μ long, or rather longer, 3 μ thick; hymenial gelatine blue with iodine. Monogr. Part ii, 353.

The thallus may become merged with the substratum and take on a dark colour. The specimens from Harlech have shorter asci 36-60 μ long.

Hab. On soil, mosses, or dead vegetation, &c.—*Distr.* Evidently rare in S. England and Wales, probably overlooked.—*B. M.* Near Perran Church, Cornwall; Braunton Beacon, Devon; Harlech, Merioneth; near Wrexham, Denbighshire; Hightown, Lancashire.

(b) Spores globose.

3. *B. ochrophora* Th. Fr. Lich. Scand. 399 (1874).—Thallus effuse, very thin, occurring in patches (K —, CaCl —), or usually obsolete. Apothecia small, convex, at length subglobose, immarginate, yellowish-pruinose, sordidly pale within; paraphyses slender, discrete, often irregular; hypothecium colourless; epithecium minutely granulose, yellow-ochraceous (K + rose-violet); spores spherical, 3.5–4.5 μ in diameter; hymenial gelatine bluish with iodine.—*Lecidea ochrophora* Nyl. in Flora xlviii. 355 (1865); Carroll in Journ. Bot. vii. 100 (1868); Cromb. Lich. Brit. 75; Leight. Lich. Fl. 354; ed. 3, 383.

Distinguished amongst its allies by the ochraceous-pulverulent apothecia, which are at times several aggregate; when the powdery surface is rubbed off they become brown.

Hab. Spreading over decayed mosses on trunks of trees in maritime and upland districts.—*Distr.* Very local and rare in the Channel Islands, Wales and S.W. Ireland.—*B. M.* Rozel, Jersey; Harlech, Merioneth; Dinish, Killarney, Kerry.

4. *B. moriformis* Th. Fr. Lich. Scand. 401 (1874).—Thallus effuse, thinnish or thin, granulose-leprose, greyish or brownish-grey (K + yellow, CaCl + red), often evanescent. Apothecia submoderate or small, sessile, somewhat plane or convex, immarginate, blackish or brownish-black, greyish within; paraphyses very slender, indistinct, the epithecium æruginous-green or dark-brownish olive; hypothecium colourless; asci tumid; spores globose, minute, 2.5–3.5 μ in diameter; hymenial gelatine deep-blue then dark with iodine. *B. resinae* var. *rubicundula* Mudd Man. 191 (1861). *Arthonia moriformis* Ach. Syn. 5 (1814). *Lecidea tantilla* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 363 (1856); Cromb. Lich. Brit. 76; Leight. Lich. Fl. 354; ed. 3, 382. *L. improvisa* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iv. 233 (1859); Cromb. Lich. Brit. 76.

Exsicc. Leight. nos. 408, 411 (as *Lecidea tantilla*).

The thallus, greyish-green when moist, varies somewhat in thickness, and is often either almost absent or obliterated by other lichens associated with it; it usually spreads extensively over the substratum, especially when subevanescent. The apothecia are numerous, scattered or approximate, unequal, sometimes two together; when moistened, or when the plant grows in shady situations, they are reddish-brown.

Hab. On old palings in lowland and upland tracts.—*Distr.* Somewhat plentiful throughout England, rare in Wales, not recorded from Scotland or Ireland.—*B. M.* Penshurst, Kent; Reigate, Surrey; Mill Hill, Middlesex; near Baunton and near Cheltenham, Gloucestershire; Spetchley, Whittington and Hindlip, Worcestershire; Stableford, Port Hill, near Shrewsbury, Neescliffe, Wellington, Upton Magna and Bomere Pool, Shropshire; Nannau, Dolgelly, Merioneth; near Redcar and Stokesley, Cleveland, Yorkshire.

5. **B. pinicola** Th. Fr. Lich. Scand. 401 (1874).—Thallus thin, effuse, whitish or greyish, finely granular or often obsolete. Apothecia minute (2–3 mm. wide), adnate convex and immarginate, reddish, brown or blackish when old; hypothecium colourless; paraphyses distinct slender, involved in mucilage which is brownish upwards; asci broadly clavate; spores globose, 3–4 μ diam.; hymenial gelatine intensely blue with iodine.—Massee Brit. Fung. Fl. iv. 96 (1895) pro parte. *Sarcogyne pinicola* Massal. in Lotos 1856, 78.

Though originally found on pine bark, has also been recorded on alder in Norway. Nearly allied to *B. moriformis* but differs in the apothecia, which are constantly lighter; they are even brighter in colour when moist. (Our specimen was collected by P. G. Rhodes and D. A. Jones in April 1924.)

Hab. On bark of trees in upland districts.—*B. M.* Cwm Bychan, Harlech, Merioneth.

6. **B. resinæ** Th. Fr. Lich. Arct. 199 (1860).—Thallus effuse, very thin, leprose-granulose, greyish or greyish-green (K —, CaCl —), usually obsolete. Apothecia small or moderate, adnate, somewhat concave or plane, pale-yellowish-brown or orange-red, the margin thin, pale, at length evanescent; paraphyses very slender, discrete, yellowish; hypothecium pale; spores globose, 2.5–3.5 μ in diameter; hymenial gelatine deep-blue with iodine.—Mudd Man. 191 (excl. var.); Massee Brit. Fung. Fl. 95. *Lecidea resinæ* Fr. Obs. Myc. i. 180 (1815); Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 363; Croumb. Lich. Brit. 76; Leight. Lich. Fl. 354; ed. 3, 383 (excl. form) & in Grevillea i. 58, t. 4, f. 9. *Peziza resinæ* Fr. Syst. Myc. ii. 149 (1822); Cooke Handb. Brit. Fung. 706.

Exsicc. Leight. n. 277; Phillips Elvell. Brit. n. 39.

A plant variously referred by authors to Lichens or to Fungi. If the thallus, as described above, be proper, it belongs to the former, as it contains gonidia. When the thallus is absent, often there is sparingly visible a soft fungoid mycelium, which would seem to indicate that it is a *Peziza*. It is retained here from its apparent affinity to other species of *Biatorella*. The spermogones, concolorous with the apothecia, sometimes occur by themselves, when they are known as *Sphaeria resinæ* Fr.

Hab. On resinous bark and decorticated trunks of firs in hilly and mountainous districts.—*Distr.* Seen from only a few scattered localities in Great Britain; not recorded from Ireland.—*B. M.* Shere, Surrey; Bettws-y-Coed, Carnarvonshire; Trefriw, Denbighshire; Cliffrigg, Cleveland, Yorkshire; Teesdale, Durham; Staveley, Westmorland; Craig Calliach and Ben Lawers, Perthshire; Countesswells Woods, near Aberdeen; Rothiemurchus Woods, Inverness-shire.

7. **B. difformis** Wainio in Helsingf. Faun. & Fl. Fenn. Medd. x. 143 (1883).—Thallus indistinct or absent (K —, CaCl —). Apothecia small, at first concave and thinly margined, becoming

slightly convex and immarginate, black, opaque, concolorous within; paraphyses discrete; epithecium and hypothecium brown; spores globose, $2-2.5\ \mu$ in diameter; hymenial gelatine and asci deep-blue with iodine.—*Peziza difformis* Fr. Syst. Mycol. ii. 151 (1823). *Lecidea difformis* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. Förh. n. ser. vii. 68 (1868); Cromb. in Grevillea xxii. 59. *L. resinæ* f. *cicatricicola* Leight. in Grevillea i. 59, t. 4, f. 9, c, e, g, k (1872) & Lich. Fl. ed. 3, 383; Cromb. in Grevillea l. c.

Differs from the preceding in the colour of the apothecia and hypothecium and in the rather smaller spores. The thallus, described by Leighton as being brownish, greenish-brown, or purplish, is evidently foreign; it grows intermixed with *B. resinæ*. The spermogones, not unfrequent, are black.

Hab. On resinous bark of firs in upland wooded districts.—*Distr.* Seen from only two localities in England and Wales; no doubt to be detected elsewhere.—*B. M.* Shere, Surrey; Bettws-y-Coed, Carnarvonshire.

8. **B. Morio** Mudd Man. 192 (1861) pro parte.—Thallus areolate, the areolæ blackish or yellowish-copper-coloured, plane, angular, somewhat shining, radiate-plicate at the circumference; hypothallus brownish-black. Apothecia minute, black, innate, plane or often angular and umbonate, with a thin flexuose margin; hypothecium colourless or brownish; paraphyses discrete, bluish-green or dark-brown at the apices; spores spherical or subellipsoid, $3-4\ \mu$ long, $2-3\ \mu$ thick.—*Lecidea Morio* Fr. Lich. Eur. 319 (1831) pro parte; Cromb. Lich. Brit. 84; Leight. Lich. Fl. 353; ed. 3, 382.

A very dark-coloured lichen owing to the predominant hypothallus; it has much the appearance of *Lecidea fuscoatra*. The thallus becomes slightly more yellow with K and CaCl.

Hab. On rocks.—*Distr.* Somewhat uncommon in maritime, or chiefly in alpine districts in England and Scotland, not recorded from Ireland.—*B. M.* Barmouth, near Dolgelly, and Cader Idris, Merioneth; Yorkshire; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire.

Var. **cinerea** Mudd 192 (1861). Thallus cracked-areolate, the areolæ crowded towards the centre, greyish-brown, less distinctly effigurate at the circumference. Apothecia larger; hypothecium brown. *Lecidea Morio* var. *cinerea* Schaer. Enum. 108 (1850).

Mudd cites Leighton's *Excicc. Lecidea fuscoatra* var. n. 304, but the specimen of this number in the British Museum belongs to *L. fuscoatra*, under which it is cited.

Hab. On granite and whinstone rocks.—*Distr.* rare in upland districts. Wales (Barmouth, Merioneth) and N. England.—*B. M.* Reston Scar, Westmorland.

§ ii. **SARCOGYNE** Th. Fr. Lich. Scand. 405 (1874). *Sarcogyne* Flot. (as genus) in Bot. Zeit. viii. 382 (1850).—Thallus superficial or immersed. Apothecia more or less carbonaceous, with prominent proper margins.

The following species of *Biatorella* were classified by Crombie under *Lecanora* (Monogr. i. 487). They are transferred to the lecideine genus because of the absence of gonidia in the apothecium.

Thallus evident.

9. ***Biatorella pruinosa*** Mudd Man. 191, t. 3, fig. 74 (1861) (incl. var. *regularis*).—Thallus thin, effuse, furfuraceous; greenish when wet, greyish-white when dry (K —, CaCl —). Apothecia small or moderate in size, appressed, plane, reddish-black when moist, black, often bluish-grey-pruinose when dry, sometimes with a thin pseudo-margin; hypothecium pale; paraphyses slender, coherent, thickly septate, scarcely widened and brown towards the apices; spores many in the ascus, minutely ellipsoid or oblong, 3–5 μ long, about 2 μ thick; hymenial gelatine bluish then tawny with iodine.—*Lichen pruinusus* Sm. Engl. Bot. t. 2244 (1811) (non Ach.). *Lecidea pruinosa* Hook. in Sm. Engl. Fl. v. 179 (1833) pro parte; Tayl. in Mackay Fl. Hib. ii. 125 pro parte. *Sarcogyne regularis* Koerb. Syst. Lich. Germ. 267 (1855). *Lecanora pruinosa* Cromb. Lich. Brit. 57 (1870) & Monogr. i. 487, fig. 68. *L. glaucocarpa* f. *pruinosa* Leight. Lich. Fl. 183 (1871); ed. 3, 168.

Exsicc. Johns. n. 420; Leight. n. 300; Mudd n. 160.

Distinguished from allied species by the habitat and by the frequently pruinose disc of the apothecium. The thallus is sometimes immersed and scarcely visible.

Hooker (in Sm. Engl. Fl. l. c.) has quoted as a synonym *Lichen pruinatus* Dicks. (errone *L. pruinusus*), published in Pl. Crypt. fasc. iii. 15, t. 9, fig. 4 (1793). According to the description, that species has a ferruginous thallus and may possibly be a form of *Lecidea confuens*.

Hab. On calcareous rocks and mortar of walls from maritime to upland regions.—*Distr.* General and common in the British Isles.—*B. M.* Near Penzance, Cornwall; Shanklin, I. of Wight; Lewes and Malling, Sussex; Shere, Surrey; Cirencester, Gloucestershire; near Hereford; Harboro' Magna and Polesworth, Warwickshire; near Malvern and Whittington, Worcestershire; Llanforda? and near Corwen, Merioneth; near Shrewsbury, Shropshire; Ingleton and Bilsdale, Cleveland, Yorkshire; near Gainford, Durham; Leven's Park and Staveley, Westmorland; Appin, Argyll; King's Park, Stirling; Craig Tulloch, Blair Athole, Perthshire; near Aberdeen; Dunkathal, Cork; White Park Bay, Antrim.

Form ***nuda*** A. L. Sm.—Thallus little visible or entirely immersed. Apothecia reddish-brown, epruinose.—*Lecanora pruinosa* f. *nuda* Nyl. ex Lamy in Bull. Soc. Bot. Fr. xxv. 423 (1878); Cromb. in Grevillea xix. 58 (1891) & Monogr. i. 488.

Lamy found this form abundant on the granitic stones of old buildings, and remarks on the regular well-opened epruinose apothecia. It is often difficult to distinguish it from the species.

Hab. On rocks chiefly calcareous, rarely siliceous and on mortar of walls in upland regions.—*Distr.* Widely distributed but rather rare in the British Isles.—*B. M.* Near Bovey Tracey, Devon; Egerton and Sevenoaks, Kent; Cirencester, Gloucestershire; Malvern, Worcestershire; Appin, Argyll; Ben Lawers and Craig Tulloch, Blair Athole, Perthshire; Applecross, Rossshire.

Var. albocincta A. L. Sm.—Thallus immersed. Apothecia thinly pruinose or naked, with a white pruinose pseudo-margin.—*Lecanora pruinosa* var. *albocincta* Cromb. Monogr. i. 488 (1894).

Hab. On the mortar of a wall in an upland district.—*B. M.* Mathon, Malvern Hills, Worcestershire (the only record).

10. *B. hypophæa* A. L. Sm.—Thallus effuse, thickish, unequally granulate, greyish- or dull yellowish-green (K —). Apothecia rather small, plane, dark-red or blackish, the proper margin unequal or subcrenulate, becoming excluded: hypothecium pale or brownish: paraphyses rather stout, thickly septate, variously widened at the yellowish-brown apices; spores many, oblong, 5–6 μ long, 1.5 μ thick; hymenial gelatine bluish then wine-red or tawny with iodine.—*Lecanora hypophæa* Nyl. in Flora liii. 34 (1870); Cromb. in Journ. Bot. viii. 97 (1870) & Monogr. i. 489; Leight. Lich. Fl. 186; ed. 3, 172.

Differs from *B. privigna*, with which it is closely allied, in the presence of the superficial thallus and in the somewhat different spores; the paraphyses are exactly alike.

Hab. On granitic stones of a wall.—*B. M.* Old Machar Cathedral, Aberdeen (the only record).

11. *B. flava* A. L. Sm. ex Johns. in Naturalist 1917, 88.—Thallus effuse, thickish, unequally granulate-cracked or scattered and furfuraceous, dull ochraceous-brown (K —). Apothecia rather small (about .5 mm. in diam.), sessile or subinnate, sometimes circumscribed, plane or rarely convex, dark reddish-brown or black, the thalline margin indistinct or disappearing: hypothecium and hymenium colourless; paraphyses slender, confluent above, flexuose, sparsely septate except near the tips which are slightly clavate and bright-brown; spores many, minute, oblong-ellipsoid, about 3 μ long, 1.2 μ thick; hymenial gelatine persistently blue with iodine. *Lecanora privigna* var. *flava* Johns. in litt.

Exsicc. Johns. n. 503.

The thallus is not unlike that of *B. hypophæa*, but in the internal structure it differs from that species as also from *B. privigna*.

Hab. On limestone in a quarry.—*B. M.* Near Langdon Beck, Teesdale, Durham.

Thallus not evident.

12. **B. clavus** Th. Fr. Lich. Scand. 409 (1874).—Thallus very reduced, occasionally a few granules only visible below the apothecia. Apothecia large, often aggregate, attached at a central point, sometimes several connate in a common attachment, concave then plane, dark-reddish or almost black, with a prominent proper margin which is persistent and crenulate; hypothecium thin, blackish-brown; paraphyses confluent, stoutish, septate, scarcely widened at the tips, the epithecium dark-brown; spores many, oblong-ellipsoid $4-5\ \mu$ long, about $2\ \mu$ thick; hymenial gelatine deep blue with iodine.—*Patellaria clavus* DC. Fl. Fr. ii. 348 (1805). *Lecidea eucarpa* Nyl. in Bot. Not. 1853, 163. *Lecanora eucarpa* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. Förh. n. ser. viii. (1871); Croub. in Grevillea xix. 58 (1891) & Monogr. i. 488. *L. glaucocarpa* f. *eucarpa* Leight. Lich. Fl. 183 (1871); ed. 3, 168. *Cathisia concinna* Stirt. in Scott. Nat. iii. 307 (1888).

Distinguished by the large apothecia with rugose margins.

Hab. On granitic rocks in maritime districts or by inland waters.—*Distr.* Rare in the Channel Islands and in Scilly, and among the Scottish Grampians.—*B. M.* West Coast of Guernsey; St. Mary's, Scilly; Loch Rannoch, Perthshire.

13. **B. privigna** A. L. Sm.—Thallus indistinct or obsolete. Apothecia moderate in size, generally congregate, rounded or angular from pressure, the disc plane, reddish when moist, blackish when dry, brick-red under the outer black crust, the margin prominent, persistent, generally entire; hypothecium pale-coloured; paraphyses slender, confluent, thickly septate, reddish-brown upwards; spores many, minutely ellipsoid, $3-4\ \mu$ long, $1.5\ \mu$ thick; hymenial gelatine blue then dull-greenish or tawny with iodine.—*Lichen simplex* Sm. Engl. Bot. t. 2152 (two right-hand figs.) (1810) (non Dav.). *Lecidea privigna* Ach. Meth. Lich. 49 (1803); Hook. in Sm. Engl. Fl. v. 184. *Endocarpon smaragdulum* var. *privigna* Leight. Angioc. Lich. 16 (1851). *Lecanora fuscata* var. *privigna* Croub. Lich. Brit. 56 (1870). *L. squamulosa* f. *privigna* Leight. Lich. Fl. 185; ed. 3, 170. *L. privigna* Nyl. in Bull. Soc. Linn. Norm. sér. 2, vi. 288 (1872); Croub. Monogr. i. 489.

Exsicc. Johns. n. 277; Larb. Lich. Hb. n. 254.

Distinguished from *B. clavus* especially by the smaller apothecia and by the pale colour of the hypothecium.

Hab. On arenaceous and granitic rocks in maritime and upland districts.—*Distr.* Rare but widely distributed in the British Isles.—*B. M.* Alderney; St. Brelade's, Jersey; Shanklin, I. of Wight; Bywell, Northumberland; Bay of Nigg, Kincardineshire; Woodside, near Aberdeen.

14. *B. simplex* Br. & Rostr. Lich. Dan. 115 (1869).—Thallus immersed. Apothecia minute, concave or plane, variously corrugate, black, the margin prominent, flexuose and irregularly crenate; hypothecium colourless or yellowish; paraphyses very slender, flexuose, sometimes branched and septate, slightly clavate and brown at the tips; spores many in the ascus, minute, ellipsoid, 3–4 μ long, 1–2 μ thick; hymenial gelatine blue then quickly wine-red with iodine.—*Lichen simplex* Dav. in Trans. Linn. Soc. ii. 283, t. 28, fig. 2 (1794); With. Arr. ed. 3. iv. 5; Engl. Bot. t. 2152 (two left-hand figs.). *Lecidea simplex* Hook. in Sm. Engl. Fl. v. 179 (1833); Tayl. in Mackay Fl. Hib. ii. 124. *Rinodina privigna* S. F. Gray Nat. Arr. i. 450 (1821). *Acarospora cervina* var. *simplex* Mudd Man. 160 (1861). *Lecanora simplex* Nyl. ex Cromb. Lich. Brit. 57 (1870) & Monogr. i. 490 (incl. f. *herpes*) (1894). *L. squamulosa* f. *simplex* Leight. Lich. Fl. 185; ed. 3, 170. *Sarcogyne simplex* var. *herpes* Norm. in Bot. Not. 38 (1872). *Exsicc.* Johns. nos. 418, 419; Larb. Lich. Hb. without a number; Leight. nos. 272, 273.

Differing from *B. privigna* in habitat and in the immersed thallus which is only rarely visible as a thin scurf. The species in this and other respects is nearly allied to *B. pruinosa*, though the apothecia are smaller and more irregular in form, sometimes almost punctiform (f. *herpes*). A form with extremely wrinkled apothecia has been classified as *Opegrapha Persoonii* var. *strepsodina* Ach. (Lich. Univ. 247); if angulose and gyrose-plicate it is *Lecanora simplex* f. *complicata* Cromb. in Grevillea xix. 58 (1891).

Hab. On rocks chiefly schistose and calcareous in maritime and mountainous regions.—*Distr.* Not uncommon throughout the British Isles. *B. M.* La Moye, Jersey; Chateau Point, Sark; Tintagel, Withiel and Penzance, Cornwall; Buckfastleigh, Ashburton and Ilfracombe, Devon; Aberdovey, Barmouth and Dolgelly, Merioneth; Bangor, Carnarvonshire; Anglesea; north of Douglas, Isle of Man; Hexham and Bywell, Northumberland; St. Bees, Cumberland; Barcaldine, Ballachulish and Glencoe, Argyll; Craig Calliach, Ben Lawers and Craig Tulloch, Blair Athole, Perthshire; Bay of Nigg, Kincardineshire; Craig Guie and Morrone, Braemar, Aberdeenshire; Dunkerron, Kerry; Glencorbot, Connemara, Galway.

75. **BIATORINA** Massal. Ric. Lich. 134 (1852) emend.; Mudd Man. 175. *Thalloidima* Massal. *tom. cit.* 95; Mudd Man. 172. *Catillaria* Massal. *tom. cit.* 78. (Pl. 9.)

Thallus minutely squamulose (*Thalloidima*), turgid or variously crustaceous. Algal cells Protococcaceæ. Apothecia either light-coloured and biatorine (*Biatorina*) or black and lecideine (*Catillaria*), the proper margin often obliterated; spores usually 8 in the ascus, ellipsoid or oblong, usually 1-septate colourless.

Massalongo described three genera, *Thalloidima*, *Catillaria* and *Biatorina*, which differ only slightly in the form of the thallus and the texture of the apothecia, but all are characterized by the colourless usually 2-celled spores. Mudd united *Catillaria* and *Biatorina* under

the latter, retaining *Thalloidima* as a separate genus for the squamulose forms. Continental lichenologists have united squamulose forms of *Biatorina* and related genera (*Bilimbia*, *Bacidia*) under *Toninia* or *Thalloidima*.

Biatorina lutea and *B. diluta* are classified as *Gyalecta* species.

Thallus squamulose.

1. **B. cœruleo-nigricans** A. L. Sm.—Thallus determinate, squamulose, pale-brown, glaucous or bluish-black (K —, CaCl —) usually densely bluish-grey-pruinose, the squamules smooth, turgid-plicate in the centre, roundly lobed at the circumference. Apothecia sessile moderate in size, plane or often somewhat convex, bluish-black, bluish-grey-pruinose or naked, the margin thick, obtuse, occasionally flexuose, at length excluded; hypothecium reddish or dark-brown; paraphyses dark-brown at the apices; spores subfusiform or subacicular, 18–30 μ long, 2–4 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lichenoides glaucum, squamis crassis, brevissimis* Dill. Hist. Musc. 228, t. 30, f. 135 (1741). *Lichen cœruleo-nigricans* Lightf. Fl. Scot. ii. 805 (1777); With. Arr. ed. 3, iv. 10; Engl. Bot. t. 1139. *Patellaria vesicularis* Hoffm. Pl. Lich. ii. 30 (1794). *Lepidoma vesiculare* S. F. Gray Nat. Arr. i. 460 (1821). *Lecidea vesicularis* Hook. Fl. Scot. ii. 40 (1821); Cromb. Lich. Brit. 76; Leight. Lich. Fl. 313. *L. cœruleo-nigricans* Schær. Enum. 101 (1850); Tayl. in Mackay Fl. Hib. ii. 131; Leight. Lich. Fl. ed. 3, 330. *Psora cœruleo-nigricans* Hook. in Sm. Engl. Fl. v. 192 (1833). *Thalloidima vesiculare* Massal. Ric. Lich. 95, f. 196 (1852); Mudd Man. 173, t. 3, f. 63.

Exsicc. Dicks. Hort. Sicc. n. 24; Bohl. n. 67; Leight. n. 335; Mudd n. 143; Larb. Cæsar. n. 34; Lich. Hb. n. 230 & Lich. Cantab. n. 29; Cromb. n. 179; Johns. n. 377.

Varying as to the colour and size of the thallus according to the nature of the habitat. The squamules are somewhat discrete or congested and either pruinose or naked or partly both. The apothecia, usually more or less scattered, are at times here and there confluent and occasionally rather large.

An apparently stunted condition, with the squamules conglomerate (f. *glebosa* Cromb. in Grevillea xxii. 59), has been found among mosses on rocks.

Hab. On the ground and in crevices of rocks, chiefly calcareous, in maritime and upland situations.—*Distr.* Not unfrequent and plentiful where it occurs, in Great Britain; apparently rare in E. Ireland and the Channel Islands.—*B. M.* Port Gorey, Sark; Quenvais, Jersey; near Ventnor, I. of Wight; Torquay, Devon; Bray Hill, St. Minver, Cornwall; Yatton and Bathford Hill, Somerset; Newhaven and Rottingdean, Sussex; near Bristol, Gloucestershire; Llangollen, Denbighshire; Thetford Warren, Norfolk; Gogmagog Hills, Cambridgeshire; Ashwood Dale, Buxton, Derbyshire; Careg Cennen, Carmarthenshire; near Tenby, Pembrokeshire; Puffin Island, Anglesea; Great Orme's Head, Carnarvonshire; Oswestry and

Llanymynech Hill, Shropshire; Giggleswick, Ingleborough and Stutton, Yorkshire; Teesdale, Durham; Whitbarrow, Mallerstang and Kendal, Westmorland; Inchkeith, near Edinburgh; near Appin House, Argyll; Ben Lawers and Craig Tulloch, Perthshire; Craig Guie, Braemar, Aberdeenshire; near Dublin; near Cork.

2. **B. candida** Jatta Syll. Lich. Ital. 372 (1900).—Thallus determinate, squamulose, white, densely white-suffused, the squamules tumid, plicate, congested and imbricate in the centre, lobed at the circumference, the lobes rarely subcrenate at the margins (K —, CaCl —). Apothecia appressed, moderate, plane or slightly convex, black, bluish-grey-pruinose, at length naked, the margin thickish, entire; hypothecium pale-reddish-brown; paraphyses subconcrete, dark-brown at the apices (K + violet); spores fusiform or fusiform-acicular, 16–23 μ long, 3–5 μ thick; hymenial gelatine bluish then sordid-wine-red with iodine.—*Lichen candidus* Weber Spicil. Fl. Goett. 193 (1778). *Lecidea candida* Ach. Meth. 79 (1803); Cromb. Lich. Brit. 77; Leight. Lich. Fl. 313; ed. 3, 330. *Lepidoma candidum* S. F. Gray Nat. Arr. i. 460 (excl. syn. Engl. Bot.) (1821). *Thalloidima candidum* Massal. Ric. Lich. 96, fig. 197 (1852); Mudd Man. 172.

Intimately related to the preceding, for states of which it might readily be taken; it differs, however, chiefly in the more constantly and densely pruinose thallus, the more persistently margined apothecia, and the paler hypothecium. The apothecia, not numerous in our specimens, become in age angulose with the margin flexuose.

Hab. Incrusting mosses on calcareous rocks and on soil in their crevices in hilly and mountainous tracts.—*Distr.* Only a very few localities in England and Wales and on the S. Grampians, Scotland.—*B. M.* Torquay, Devon; Cleeve Hill, Yatton, Somerset; Ingleborough, Yorkshire; Great Orme's Head, Carnarvonshire; Isle of Man; summit of Craig Calliach, Head of Loch-na-Gat, and near the summit of Ben Lawers, Perthshire.

3. **B. tumidula** A. L. Sm. Thallus subdeterminate, thickish, verrucose- or areolate-squamulose, the areolæ sublobate-plicate, turgid, wrinkled or cracked on the surface, white or glaucous-white (K —, CaCl —). Apothecia moderate, sessile on the margins of the areolæ, at first plane and thinly margined, then convex and immarginate, often confluent, black, naked; hypothecium thick, reddish-black; spores oblong, indistinctly 1-septate 12 μ long, 6 μ thick; hymenial gelatine bluish with iodine.—*Lichen tumidulus* Sm. in Trans. Linn. Soc. i. 82, t. 4, f. 3 (1791). *L. mamillaris* Gouan Herb. Montp. 88 (1796). *Lecidea mamillaris* Duf. in Fr. Lich. Eur. 285 (1831); Carroll in Journ. Bot. iii. 290 (1865); Cromb. Lich. Brit. 77; Leight. Lich. Fl. 254; ed. 3, 245. *Thalloidima mamillare* Massal. Ric. Lich. 96, fig. 198 (1852); Mudd Man. 173.

Well characterized by the superficially wrinkled or subgyrose thallus. The squamules, usually crowded, are at times somewhat scattered; the spores are obscurely bilocular.

Hab. On the soil in crevices of sandy and calcareous rocks in maritime and upland districts.—*Distr.* Very local and scarce in S.W. and (*vide* Leighton) in central England (Dovedale, Derbyshire).—*B. M.* Anstey's Cove and Torquay, Devon; Cleeve Hill, Yatton, Somerset.

4. *B. cumulata* Th. Fr. Lich. Arct. 187 (1860).—Thallus effuse, thickish, unequal, warted or squamulose, the squamules small, crenate-lobed or radiating at the circumference, greyish (K + yellow, CaCl —); hypothallus black. Apothecia minute, plane, crowded, black or reddish-black, with a thin paler margin, at length evanescent; hypothecium pale-brownish, narrow, reddish-coloured in a thick section; paraphyses coherent, rather thickened and brown towards the apices; spores oblong or fusiform, usually 1-septate, sometimes simple or faintly 2-3-septate, 13–18 μ long, 4–6 μ thick; hymenial gelatine bluish then sordid-wine-red with iodine.—*Lecidea cumulata* Sommerf. Suppl. Fl. Lapp. 157 (1826). *L. conglomerata* Cromb. in Grevillea xxii. 59 (non Ach. 1893).

One of the rarest British lichens. The squamules, either contiguous or scattered, are at times so minute and crowded in the centre that the thallus appears as if warted and cracked. The apothecia, densely conglomerate, very rarely solitary, are usually situated between the squamules.

Hab. On the ground in alpine situations.—*B. M.* Summit of Ben Lawers, Perthshire; near the summit of Ben Avon, Braemar, Aberdeenshire.

Thallus crustaceous.

(a) Apothecia mostly light in colour.

5. *B. jejuna* A. L. Sm.—Thallus dark-grey or bluish-grey-green, thin, effuse, continuous or slightly cracked. Apothecia minute, prominent, pale-waxy-reddish with a thickish pale margin; hypothecium colourless; epithecium yellowish; spores ellipsoid, 18–23 μ long, 7–9 μ thick; hymenial gelatine blue then violet with iodine.—*Lecanora jejuna* Nyl. in Flora lviii. 442 (1875). *Lecidea subdiluta* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 145, t. 22, figs. 13–16 (1876) & Lich. Fl. ed. 3, 340.

Exsicc. Larb. Lich. Hb. n. 846.

Not unlike *Lecania Ralfsii* (Part I. 342 (1918)), under which species it was classified by Crombie.

Hab. On siliceous rocks, rare.—*B. M.* Boulay Bay, Jersey (the only locality).

6. *B. Arnoldi* Krempelh. in Flora xxxviii. 72 (1855).—Thallus effuse, thin, subleprose, whitish (K —, CaCl —). Apothecia small, sessile or adnate, at first concave, margined, at length almost plane and subimmarginate, saffron-reddish, the margin paler; paraphyses slender, subdiscrete; epithecium and hypothecium deep-yellow; spores oblong, normally 1-septate (at times

obsoletely 3-septate), 13–18 μ long, 5–6 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea Arnoldi* Nyl. in Flora lxii. 223 (1879); Cromb. in Journ. Bot. xiv. 361 (1876); Leight. Lich. Fl. ed. 3, 340 (excl. syn. *B. minuta*).

From the appearance of the young apothecia might at first sight be taken for a *Gyalecta*. The thallus is often scarcely distinct, and is then more or less confused with the substratum. In the British specimens the apothecia are minute and rather scattered.

Hab. On shaded calcareous rocks in mountainous tracts.—*Distr.* Only in N.W. Ireland and the S.W. Highlands, Scotland.—*B. M.* Achosragan Hill, Appin, Argyll; Twelve Pins, Connemara, Galway.

Var. luteella A. L. Sm.—Thallus thin, often in white patches. Apothecia colourless within, the asci usually thick and solid at the apices; spores oblong or oblong-fusiform, 16–23 μ long, 6–7 μ thick.—*Lecidea luteella* Nyl. in Flora xlviii. 6 (1865); Carr. in Journ. Bot. iii. 290 (1865); Leight. in Ann. Mag. Nat. Hist. ser. 3, xvii. 62; Cromb. Lich. Brit. 73; Leight. Lich. Fl. 322; ed. 3, 339. Specimen not seen.

Scarcely differs from the species except in the colourless hypothecium and epithecium and in the slightly larger spores.

Hab. On calcareous rocks in upland districts.—*Distr.* S. England (Eastbourne, Sussex) and N.E. Ireland (Sheepwalk, Armagh).

Subsp. delutula A. L. Sm.—Thallus very thin, at length rimose, greyish-green. Apothecia minute, usually gyalectoid, pale-yellowish-flesh-coloured; spores 12–16 μ long, 4–5 μ thick.—*Lecidea delutula* Nyl. in Flora lxii. 223 (1879); Cromb. in Grevillea viii. 30.

Characterized chiefly by the habitat, by the differently coloured thallus, and the paler, smaller apothecia. In the two specimens seen, which are well fertile, the thallus is scattered and only here and there visible.

Hab. On moist siliceous ferruginous rocks in a mountainous district.—*B. M.* Lough Feagh, Connemara, Galway (the only locality).

7. *B. bæomma* A. L. Sm. Thallus indeterminate, thin, opaque, unequal, faintly cracked, glaucous or yellowish-white (K + yellow, CaCl —). Apothecia moderate, plane, subangulose-diform, pale-reddish, livid or livid-brown, with a white, thickish, epithalline margin; paraphyses somewhat slender; epithecium yellowish-granulose; spores oblong, 10–18 μ long, 4–6 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*Lecanora bæomma* Nyl. in Flora lix. 233 (1876); Leight. Lich. Fl. ed. 3, 221. *Lecidea bæomma* Nyl. in Flora lx. 459 (1877). *L. rupicola* Nyl. *tom. cit.* 228, 562; Cromb. in Grevillea vi. 19; Leight. Lich. Fl. ed. 3, 337 & 546.

Exsicc. Larb. Lich. Hb. n. 26.

Hab. On mica-schist rocks near the sea.—*B. M.* Doughruagh Mts., Letterbeg and Letterfrack, Connemara, Galway.

Var. **glaucocarnea** A. L. Sm.—Thallus determinate, rugulose or subleprose, cracked-areolate, glaucous-green. Apothecia pale-flesh-coloured or livid, sometimes slightly pruinose, the margin somewhat paler, at length evanescent.—*Lecidea glaucocarnea* Nyl. in Flora lx. 459 (1877). *L. cæsirolepra* Nyl. op. cit. lxiv. 532 (1881); Cromb. in Journ. Bot. xx. 275 (1882). *Lecanora glaucocarnea* Nyl. in Flora lx. 562 (1877); Leight. Lich. Fl. ed. 3, 221.

Ersicc. Larb. Lich. Hb. nos. 135, 336 (as *Lecanora albariella* f. *caesia*).

The apothecia, as in the species, are extremely minute and look as if seated on small pale cushions of the thallus, though in the variety the thalline growth tends to disappear.

Hab. On rocks.—*Distr.* Rare in the Channel Islands and W. Ireland.—*B. M.* Eperquerie, Sark; Glendalough, Connemara, Galway.

8. **B. littorella** A. L. Sm.—Thallus effuse, very thin, rimulose, glaucous-green. Apothecia small, plane, submarginate, pale-yellow, becoming deeper yellow; paraphyses slender; epithecium and hypothecium colourless; spores oblong, 8–12 μ long, 3·5–4·5 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea littorella* Nyl. in Flora lx. 229 (1877); Cromb. in Grevillea vi. 19; Leight. Lich. Fl. ed. 3, 339.

Differs from the preceding in the brighter coloured apothecia and in the constantly smaller spores.

Hab. On schistose rocks.—*B. M.* Penzance, Cornwall; Quantock Hills, Somerset; Foynes, Limerick; Lough Inagh, Connemara, Galway.

9. **B. pilularis** Koerb. Parerg. Lich. 136 (1860).—Thallus effuse, thin, finely granular, greyish-white or greenish (K —, CaCl —). Apothecia adnate, convex or almost globose, immarginate, yellowish-flesh-coloured or brick-reddish; hypothecium colourless; paraphyses coherent, apices colourless; spores ellipsoid, 1-septate or sometimes simple, 11–17 μ long, 5–6 μ thick; hymenial gelatine bluish then violet or wine-reddish with iodine.—*Lecidea vernalis* Tayl. in Mackay Fl. Hib. ii. 127 (1836) (non Ach.). *L. vernalis* f. *subduplex* Nyl. Lich. Scand. 201 (1861); Cromb. Lich. Brit. 68; Leight. Lich. Fl. 262; ed. 3, 259. *L. pilularis* Leight. Lich. Fl. ed. 3, 341 (1879). *L. subduplex* Nyl. Lich. Fret. Behr. 50 (1888).

Ersicc. Larb. Lich. Hb. nos. 231, 270.

Characterized by the bright prominent sometimes almost spherical apothecia which have caused it to be confused with *Bilimbia sphaeroides* Koerb. The apothecia are numerous and vary in size; at times they are crowded and rather small. *Lichen pilularis* Dav. (Trans. Linn. Soc. ii. 283, t. 28, fig. 2 (1794)) from Bodowen Park, Anglesea, is quoted in With. Arr. ed. 3, iv. 7: the specimen from the same locality has been

identified by Crombie as *Lecidea contigua* f. *minor* (Grevillea xii. 57 (1883)).

Hab. On mossy trunks of trees, rarely stems of shrubs in upland wooded situations, also on mossy soil. *Distr.* Scarce in England; more frequent in the S. Highlands of Scotland, and in N.W. Ireland.—*B. M.* Epping Forest and Hatfield-Peverel, Essex; St. Leonard's Forest, Sussex; Brandon, Suffolk; Ewenny, Bridgend, Glamorgan; Prescoed, near Usk, Monmouthshire; Llanwrtyd, Breconshire; Cader Idris, Merioneth; Rievaulx and Bilsdale, Yorkshire; Kentmere, Westmorland; Falls of Clyde, Lanarkshire; Woods, near Forfar; Barcaldine, Argyll; Glen Lochay, Killin, Ben Lawers and Aberfeldy, Perthshire; Dunkerron, Kerry; Leenane, Derryclare and Glendalough, Galway.

10. *B. fallax* A. L. Sm.—Thallus effuse, thin, subleprose, blackish-green. Apothecia yellowish-flesh-coloured, somewhat convex, becoming immarginate, entirely colourless within; paraphyses slender, distinct; spores oblong or fusiform, 9–13 μ long, 3 μ thick; hymenial gelatine blue then violet with iodine.—*Biatora fallax* Hepp Flecht. Eur. n. 505 (1860) (excl. syn. *Lecidea fallax* Leight. Lich. Fl. 320 (1871); ed. 3, 342). *L. chlorotiza* Nyl. in Flora xlix. 85 (1866) (*vide* Leight. l. c.); Cromb. Lich. Brit. 70.

There are no specimens of this lichen in the herbarium of the British Museum. Hepp plainly indicates the 2-celled spores.

Hab. On elm bark. *Distr.* Recorded only from S. England, I. of Wight and Somerset.

11. *B. subsphæroides* A. L. Sm.—Thallus determinate, thinnish, areolate-rimose, rugulose, whitish. Apothecia moderate, at first plane and thinly margined, at length convex and immarginate, pale-reddish or brownish; hypothecium pale; paraphyses rather coherent; spores ellipsoid or oblong-ellipsoid, 14–17 μ long, 6–7 μ thick; hymenial gelatine bluish, the asci at length violet, with iodine.—*Lecidea subsphæroides* Nyl. in Flora lvi. 294 (1873); Cromb. in Grevillea ii. 89; Leight. Lich. Fl. ed. 3, 343.

Differs from the preceding in the more distinct thallus and in the larger less brightly coloured apothecia.

Hab. On beech trees, rare.—*B. M.* Near Lyndhurst, New Forest, Hants (the only locality).

12. *B. graniformis* A. L. Sm.—Thallus effuse, granulate or verrucose-rugose, pale-yellow, whitish-glaucous or straw-coloured (Kf + yellowish, CaCl—), at times subevanescent. Apothecia small, adnate, pale-yellow, plane and obtusely margined, the margin often flexuose, at length slightly convex and immarginate; hypothecium colourless; paraphyses coherent, colourless; epithecium subgranulose, yellow; spores oblong or fusiform-oblong, thinly 1-septate, 8–11 μ long, 2.5–3.5 μ thick; hymenial gelatine bluish then sordid-violet with iodine.—*B. Ehrhartiana* Mudd Man. 176 (1861). *Lichen graniformis* Hagen Tent. Hist. Lich. xlvii. t. 1, f. 2 (1782); Dicks. Crypt. fasc. i. 10 (1785); Engl. Bot. t. 1464

(spermogoniiferous state). *L. Ehrhartianus* Ach. Prodr. 39, t. 2, f. 1 (1798); Dicks. Crypt. fasc. iv. 22 (non Engl. Bot. t. 1136 which is *Lecanora conizaea* Ach.). *Lecidea Ehrhartiana* Ach. Meth. 73 (1803); S. F. Gray Nat. Arr. i. 474; Hook. in Sm. Engl. Fl. v. 185; Turn. & Borr. Lich. Brit. 142; Leight. Angioc. Lich. 69 & Lich. Fl. 320; ed. 3, 342; Cromb. Lich. Brit. 65. *Cllostomum corrugatum* Fr. Lich. Eur. 455 (1831) (spermogones only); Leight. Angioc. Lich. 69 (1851).

Exsicc. Leight. n. 410.

A singular plant which might readily be taken for a biatorine state of a species allied to *Lecanora varia*, of which Schærer (Enum. 82) considered it a variety. A very marked character is afforded by the numerous large spermogones, which were formerly regarded as foreign parasitical bodies or, in sterile specimens, as abortive apothecia. They are superficial, black, usually crowded, warted and corrugate (K + rose-violet), beneath colourless, with short, simple sterigmata and oblong spermatia, 2–3 μ long, 1 μ thick.

Hab. On old palings, rarely on trunks of trees, in maritime and upland situations.—*Distr.* Local, though plentiful where it occurs, in E., S., and W. England, and in S. Wales.—*B. M.* Near Acle and Yarmouth, Norfolk; Livermere, Suffolk; near Colchester, Essex; Penshurst, Kent; Pembridge, Herefordshire; Harboro' Magna, Warwickshire; Llandrindod, Radnorshire; near Ayton, Yorkshire; Holker Park, Lancashire.

13. *B. cyrtella* Th. Fr. Lich. Arct. 186 (1860) (non Koerb. *fide* Th. Fr. Lich. Scand. 294 (1871).—Thallus effuse, very thin, unequal, pale or whitish (K —, CaCl —), often evanescent. Apothecia small, at first plane, with thin white epithalline margin, then convex and immarginate, pale-brown, sordid- or pale-reddish; hypothecium colourless; paraphyses concrete, pale at the apices; spores 8–16 in the ascus, oblong or oblong-fusiform, 1–2 septate, 9–16 μ long, 4–5 μ thick; hymenial gelatine bluish then wine-red or violet with iodine.—*Lecidea cyrtella* Ach. Meth. 67 (1803); S. F. Gray Nat. Arr. i. 471; Cromb. Lich. Brit. 72; Leight. Lich. Fl. 318; ed. 3, 341. *L. anomala* Ach. Syn. 38 (1814) pro parte; Hook. in Sm. Engl. Fl. v. 182 pro parte. *Lichen cyrtellus* Sm. Engl. Bot. t. 2155 (1810).

Exsicc. Johns. n. 509; Larb. Lich. Hb. n. 173.

Referred sometimes to *Lecania* (Lecanoraceæ) on account of the thin epithalline margin which disappears soon, the species becoming wholly biatorine. The spores are usually of the 1-septate type of *Biatorina*, though in the same apothecia there are to be found 2-septate spores like those of *Bilimbia*.

Hab. On the bark of trees.—*Distr.* Not unfrequent throughout the British Isles.—*B. M.* Launceston, Cornwall; Shanklin, I. of Wight; Cockington, Devon; Henfield, Sussex; Hadleigh Woods, Southend, Essex; Lyminster, Hants; Farmington and near Cirencester, Gloucestershire; Thame Park, Oxfordshire; Malvern, Worcestershire; Ayton, Cleveland, Yorkshire; Wark-on-Tyne, Northumberland;

Lowther Park, Westmorland; Glen Falloch, Perthshire; Riverstone, near Cork; Mount Shannon and Tervoe, Limerick; Dromoland, Clare.

14. **B. Griffithii** Massal. Ric. Lich. 134 (1852) pro parte; Mudd Man. 176.—Thallus effuse, thin, unequal or subgranular and wrinkled, whitish or greyish-white (K + yellow, CaCl —), occasionally nearly obsolete. Apothecia small or submoderate, adnate, plane, at length slightly convex, margined, brownish-flesh-coloured, dull-brown or blackish, the margin thin, pale; paraphyses more or less discrete, dark or yellowish at the apices; hypothecium colourless; spores fusiform or oblong, thinly 1-septate, 10–20 μ long, 3.5–4.5 μ thick; hymenial gelatine deep-blue then more or less sordid-wine-coloured with iodine.—*Lichen Griffithii* Sm. Engl. Bot. t. 1735 (1807). *Lecidea Griffithii* Hook. in Sm. Engl. Fl. v. 177 (1833); Tayl. in Mackay Fl. Hib. ii. 120 pro parte; Cromb. in Grevillea xxii 11 (incl. f. *limitata* Cromb.). *L. tricolor* Nyl. Lich. Scand. 207 (1861) (non With. see Grevillea xii. 60); Cromb. Lich. Brit. 72; Leight. Lich. Fl. 321; ed. 3, 337. *Biatora mixta* Fr. in Vet. Acad. Handl. 1822, 267.

Ersicc. Bohl. n. 119; Mudd n. 155 (pro parte); Leight. n. 60 (as *Biatora mixta*); Larb. Lich. Hb. nos. 268, 345; Johns. n. 451.

The original specimens were collected by Griffith and preserved in Withering's herbarium labelled *Lichen corneus*. Withering's description and figure of *L. corneus* do not agree with these specimens (see p. 9), as was pointed out by Smith (Engl. Bot. t. 1735), who determined and named the plant *L. Griffithii* in honour of the collector.

Hab. On smoothish bark of trees, rarely on naked trunks, in upland, rarely maritime wooded tracts.—*Distr.* Not uncommon in England, scarce in the S.W. Highlands of Scotland, S. Ireland, and the Channel Islands.—*B. M.* St. Peter's Valley, Jersey; Runton, Norfolk; Hadleigh, Hockley, Ulting, Gosfield Hall, Quendon Wood and Epping Forest, Essex; Ightham, Kent; St. Leonard's Forest, Sussex; New Forest, Hants; Ullacombe, Bovey Tracey, Devon; Oakley Park, Cirencester, and Sapperton, Gloucestershire; Twycross, Gopsall Park, Leicestershire; Malvern, Worcestershire; Ludlow, Limekiln Wood, Wrekin and Haughmond Hill, Shropshire; near Harboro' Magna, Warwickshire; Builth, Breconshire; Garn, Denbighshire; Airyholm Wood and near Ayton, Cleveland, Yorkshire; Teesdale, Durham; Lamplugh, Cumberland; by Loch Lomond, Dumbartonshire; Glen Falloch, Perthshire; Glenstale and Templemore, Tipperary; Deer Park, Castle Bernard, Cork.

15. **B. Bouteillei** Arnold ex Syd. Flecht. Deutschl. 167 (1887). Thallus effuse, thin, filmy, minutely granulose, pale-greenish-white (K —, CaCl —). Apothecia minute, adnate-sessile, plane, yellowish-flesh-coloured, the margin thin, entire or crenate-flexuose, paler; hypothecium colourless; paraphyses slender, irregular; spores ellipsoid, minute, 8–10 μ long, 3–4 μ thick; hymenial gelatine bluish then sordid-yellow, the asci persistently bluish at the apices, with iodine.—*Parmelia Bouteillei* Desmaz. in Ann. Sci. Nat. sér. 3, vii. 191 (1847). *Lecidea Bouteillei* Nyl. in

Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 152 (1866) (note); Croub. in Journ. Bot. ix. 178 (1871); Leight. Lich. Fl. 323; ed. 3, 342.

Hab. On leaves of box and fir, and on elm bark. *Distr.* Rather rare in the Channel Islands, S. England and Ireland on leaves of box.—*B. M.* Danny and Woolstonbury, Sussex; Abbeyleix, Queens Co.

16. *B. erysiboides* Th. Fr. in Vet. Akad. Förh. 1864, 271.—Thallus subeffuse, very thin, leprose, green or greenish, subobsolete (K —, CaCl —). Apothecia small, somewhat convex, immarginate, opaque, brick-coloured, reddish or yellowish; hypothecium colourless; paraphyses coherent, colourless; spores shortly ovoid, 7–10 μ long, 3–5 μ thick; hymenial gelatine bluish then sordid-wine-red with iodine.—*Lecidea erysiboides* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. i. 232 (1858–9); Croub. in Grevillea xxii. 11 & Lich. Brit. 72 (excl. f. *sordidescens*); Leight. Lich. Fl. 323; ed. 3, 343 (excl. same form).

From its external aspect might readily be taken for a state of *Lecidea vernalis*, but is definitely separated by the ovoid septate spores, which are somewhat similar to those of many *Arthonia*. The thallus, usually scarcely visible, is often entirely obsolete. In moist situations the apothecia are at times pale, convex, and several congregate (f. *pallida* Nyl. ex Croub. Lich. Brit. l. c.).

Hab. On decaying trunks and stumps of trees in wooded maritime and upland districts.—*Distr.* Local in S. England and the S. Grampians, Scotland.—*B. M.* Shanklin, I. of Wight; Lymington, Hants; near Buckfastleigh, Devon; Cirencester, Gloucestershire; Loch Katrine, Perthshire (f. *pallida*).

(b) Apothecia dark or blackish.

17. *B. prasina* Syd. Flecht. Deutschl. 166 (1887).—Thallus effuse, thinnish, contiguous or scattered, subgranulose-leprose, sordid-greenish (K —, CaCl —). Apothecia minute, innate-sessile, convex, immarginate, livid-brown or usually becoming blackish; hypothecium colourless or pale-yellowish; paraphyses coherent, light-coloured upwards; spores oblong-ellipsoid, 11–12 μ long, 4 μ thick; hymenial gelatine bluish then sordid-wine-red with iodine.—*Micarea prasina* Fr. Syst. Orb. Veg. 257 (1825). *Lecidea prasina* Schær. Enum. 137 (1850); Mudd Man. 196; Leight. Lich. Fl. 263; ed. 3, 261. *L. prasiniza* Nyl. in Flora lvii. 312 (1874) & lxiv. 7 (1881); Croub. in Journ. Bot. xiii. 141 (1875); Leight. Lich. Fl. ed. 3, 338.

Differs from *B. erysiboides* chiefly in the rather more developed thallus, the dark colour of the smaller more convex apothecia and the often simple spores. The few British specimens gathered are imperfectly fertile; the sterile pulverulent thallus spreads extensively over the substratum.

Hab. On old trunks of trees in a maritime locality.—*Distr.* Rare in England and S.W. Highlands of Scotland.—*B. M.* Lyndhurst, Hants; Cleeve Hill, near Cheltenham, Gloucestershire; Barcaldine, Argyll.

Var. **byssacea** A. L. Sm. —Thallus minutely granular, dirty-greenish. Apothecia dark; paraphyses dark at the tips.—*Biatora byssacea* Zwackh. in Flora xlv. 510 (1862). *Lecidea erysiboides* f. *sordidescens* Nyl. ex Norrlin in Not. Sällsk. Faun. & Fl. Fenn. n. ser. viii. 188 (1871); Cromb. Lich. Brit. 72; Leight. Lich. Fl. 323; ed. 3, 343. *Biatorina prasiniza* f. *byssacea* Arnold Lich. Fl. Münich, 24 (1897).

Differs from the species in the darker colour of the apothecia and of the paraphyses.

Hab. On old decorticated trees in moist places.—*B. M.* Lyndhurst, New Forest, Hants; Ravenscar, Westmorland.

18. **B. globulosa** Koerb. Syst. Lich. Germ. 191 (1855).—Thallus effuse, very thin, granulose-pulverulent, whitish (K —, CaCl —), often evanescent. Apothecia small, adnate, convex, immarginate, blackish or leaden-black, greyish within; paraphyses concrete; epithecium blackish; hypothecium pale or slightly sordid above; spores oblong or fusiform-oblong, simple or thinly 1-septate, 9–14 μ long, 2–4 μ thick; hymenial gelatine bluish then dark-wine-red with iodine.—*Lecidea globulosa* Floerke Deutsche Lich. lief. 10, 1 (1821); Carroll in Journ. Bot. v. 256 (1867); Cromb. Lich. Brit. 69; Leight. Lich. Fl. 319; ed. 3, 334. *L. anomala* Nyl. Lich. Scand. 202 (non Ach.); Leight. Lich. Fl. 318; ed. 3, 337. *Biatora anomala* Fr. in Vet. Acad. Handl. 1822, 266. *Bilimbia anomala* Mudd Man. 187 (1861) pro parte.

Exsicc. Mudd n. 155 (pro parte).

Hab. On the bark of trees.—*Distr.* Uncommon throughout the British Isles.—*B. M.* Ayton, Cleveland, Yorkshire; Glencar, Kerry.

19. **B. spodiza** A. L. Sm.—Thallus effuse, thin, subopaque, minutely granulate, dark-greyish or interspersed with minute greyish-green granules (K(CaCl) + deep-red). Apothecia small, somewhat convex, immarginate, livid-greyish or pale-livid; hypothecium colourless; epithecium sordid; paraphyses not well discrete; spores oblong, at times somewhat curved, occasionally obsoletely or spuriously 1-septate, 11–17 μ long, 2.5–3.5 μ thick; hymenial gelatine bluish with iodine.—*Lecidea spodiza* Nyl. in Flora lvii. 9 (1874); Cromb. in Grevillea ii. 140; Leight. Lich. Fl. ed. 3, 339.

Closely allied to the following. In the original locality the thallus spread extensively over the substratum, but was only here and there fertile; the apothecia in the specimens are somewhat scattered.

Hab. On an old fir paling in a wooded upland district.—*B. M.* Finlarig, Killin, Perthshire (the only locality).

20. **B. synothea** Koerb. Parerg. Lich. 144 (1860) (excl. var. *chalybæa*).—Thallus effuse, thin, minutely granulose, greyish-green or whitish (K —, CaCl —), at times nearly evanescent. Apothecia small, adnate or appressed, convex, subimmarginate,

dark-brown, black or blackish; hypothecium thin, colourless; paraphyses dark at the apices; epithecium K + violet; spores oblong, ellipsoid-oblong or fusiform, straight or slightly curved, occasionally simple, 7–13 μ long, 2.5–4 μ thick; hymenial gelatine bluish then wine-red with iodine; spermogones numerous, spermatia oblong or oblong-ellipsoid, 4–5 μ long, 2 μ thick.—Mudd Man. 179. *Lecidea synothea* Ach. Syn. 26 (1814) pro parte; Borr. in Engl. Bot. Suppl. t. 2711; Hook. in Sm. Engl. Fl. 179. *L. denigrata* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 149 (1866); Cromb. in Grevillea xxii. 10 & Lich. Brit. 70; Leight. Lich. Fl. 320; ed. 3, 364. *L. parissima* Nyl. ex Cromb. in Journ. Linn. Soc. xi. 484 (1871); Leight. Lich. Fl. ed. 3, 256. *L. hemipoliella* Nyl. in Flora lviii. 11 (1875); Leight. Lich. Fl. ed. 3, 339 (e descript.). *Biatora denigrata* Fr. in Vet. Acad. Handl. 1822, 265 & Lich. Eur. 270.

Exsicc. Johns. n. 373.

Not unlike dark forms of *B. prasina*, but characterized by the structure of the apothecia and the appearance of the spermogones. The thallus, which spreads extensively, is at times blackish, and occasionally but little visible, but in that case the numerous and often conglomerate apothecia make the plant sufficiently conspicuous. The spermogones are usually abundant and are readily observed from the extrusion of the white spermatia in the form of globules.

Hab. On old palings, and occasionally on decorticated stumps of trees in upland wooded districts.—*Distr.* Not unfrequent in England, apparently rare in Scotland; not seen from Ireland or the Channel Islands.—*B. M.* Near Highbeach, Epping Forest, Essex; Esher, Surrey; near Tunbridge Wells, Kent; Albourne and Henfield, Sussex; New Forest, Hants; near Bovey Tracey, Devon; near Hendon and Mill Hill, Middlesex; Oaksey, Wilts; near Elstree, Herts; Langford and Chelmsford, Essex; Twycross and Gopsall, Leicestershire; near Cheltenham, Gloucestershire; Battenhall, near Worcester; near Barmouth, Merioneth; Oswestry and near Shrewsbury, Shropshire; near Ayton, Cleveland, Yorkshire; Egremont and Asby, Cumberland; Finlarig, Killin and Killiecrankie, Perthshire.

Var. semialbula A. L. Sm.—Thallus whitish or livid-whitish, thin, slightly rimulose-areolate; spores 2–4-guttulate, septa discernible on treatment with potash.—*Lecidea hemipoliella* var. *semialbula* Nyl. ex Stirton in Trans. Glasgow Soc. Field Nat. 1875, 89; Leight. Lich. Fl. ed. 3, 339.

Hab. On decorticated wood. Collected by Dr. Stirton near Altnaharra, Sutherland (specimen too scanty for examination).

Subsp. subnigrata A. L. Sm.—Thallus effuse, granulose-areolate and furfuraceous, dark-greyish (K —, CaCl —). Apothecia small, convex, immarginate, usually conglomerate, brownish- or reddish-black, colourless within; hypothecium colourless; epithecium sordid-yellowish, paraphyses not discrete; spores ellipsoid, 9–11 μ long, 4–5 μ thick; hymenial gelatine bluish

with iodine.—*Lecidea subnigrata* Nyl. in Flora xlix. 370 (1866); Leight. Ann. Mag. Nat. Hist. ser. 3, xix. 403 (1867) & Lich. Fl. 316; ed. 3, 331. *Lecidea denigrata* subsp. *subnigrata* Croub. Lich. Brit. 70.

Scarcely to be distinguished from the species, the minor differences being probably due to the nature of the substratum. In the specimens seen the apothecia are numerous.

Hab. On schistose rocks in hilly and mountainous districts. —*Distr.* Very local and scarce in S.W. England, N. Wales, and the central Grampians, Scotland.—*B. M.* Bathampton Downs, Somerset; Cader Idris, Merioneth; Craig Tulloch, Blair Athole, Perthshire.

21. **B. premnea** A. L. Sm.—Thallus greyish-green or whitish, cartilaginous, thin, unequal, continuous or rimose (K —, CaCl —). Apothecia rather large, black, scattered, sessile, plane, the disc minutely papillate, margin thickish, shining, becoming convex and immarginate; hypothecium bluish-black; paraphyses slender, conglutinate, dark-bluish-green or dark-brown towards the tips; spores ellipsoid or oblong, obtuse, rather large, 20–30 μ long, 8–18 μ thick, sometimes slightly constricted at the septum; hymenial gelatine blue then wine-red with iodine.—*B. grossa* Mudd Man. 181, Pl. 3, f. 67 (1861). *Lecidea premnea* Fr. in Vet. Acad. Handl. 1822, 260 (pro max. parte, *vide* Th. Fr. Lich. Scand. 581) (non Ach.). *L. grossa* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 385 (1857); Croub. Lich. Brit. 89; Leight. Lich. Fl. 310; ed. 3, 328. *L. leucoplaca* Chev. Fl. Env. Paris, 572 (1826)?

Exsicc. Bohl. n. 90; Mudd n. 147; Leight. n. 125 (as *Lecidea leucoplaca*); Johns. n. 360.

Liable to be confused with *Lecanactis premnea*, to which it is externally somewhat similar. Often cited as *L. grossa* Pers. a manuscript name in Hb. Mougeot.

Hab. On trunks of trees in wooded regions.—*Distr.* Frequent in most parts of the British Isles.—*B. M.* Withiel, Cornwall; Newton Bushell, Devon; Bembridge, I. of Wight; Lyndhurst, Hants; between Henfield and Brighton, and Cowdown, Poynings, Sussex; Shere, Surrey; Kent; Gosfield Hall, Essex; Chedworth Woods, near Cirencester, Gloucestershire; Gopsall Wood, Leicestershire; Nannau, Dolgelly, Merioneth; Airyholme Wood, Cleveland, Yorkshire; Wark-on-Tyne, Northumberland; Windermere, Lowther Park and Mardale, Westmorland; near Penrith, Cumberland; Lanark; near Edinburgh; The Trossachs, Kenmore, Aberfeldy, Glen Falloch, Glen Lochay and Finlarig, Killin, Perthshire; Appin and Barealdine, Argyll; Invermoriston and Fort William, Inverness-shire; Morrone, Bracmar, Aberdeenshire; Derryquin, Glencar, Muckross and Dinish, Kerry; Dromoland, Clare; Loughcooter, Galway.

22. **B. pulvereæ** Mudd Man. 180 (1861).—Thallus effuse, thickish, minutely granular-pulverulent or leprose, soft, greyish-green, glaucous, or yellowish-green, becoming white (K + yellow, CaCl —). Apothecia somewhat large, scattered, adnate-sessile,

plane, black with a paler rather prominent margin, becoming convex and immarginate, pale within, hypothecium brownish-yellow, the lower stratum paler; paraphyses coherent, blackish at the apices; spores oblong or ellipsoid, 15–18 μ long, 7–9 μ thick; hymenial gelatine deep-blue then violet-coloured with iodine.—*Lecidea pulverea* Borr. in Engl. Bot. Suppl. t. 2726 (1831); Hook. in Sm. Engl. Fl. 181; Tayl. in Mackay Fl. Hib. ii. 126; Cromb. Lich. Brit. 89; Leight. Lich. Fl. 322; ed. 3, 334. *L. incana* Del. ex Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. 200 (1855).

Exsicc. Cromb. n. 187; Larb. Lich. Hb. n. 150.

Resembles *B. Lightfootii* var. *commutata*, but is easily distinguished by the larger spores. The apothecia are, according to Nylander (Flora li. 347), at times pale-flesh-coloured, which is not the case in the British specimens; they are sometimes conglomerate.

Hab. On trunks of old trees generally near the roots, rarely incrusting mosses on rocks in maritime and mountainous districts.—*Distr.* Somewhat local, though usually plentiful where it occurs throughout the British Isles.—*B. M.* Withiel, Cornwall; near Torquay and Lustleigh, Devon; New Forest, Hants; Ardingly and St. Leonard's Forest, Sussex; Capel Cym and Barmouth, Merioneth; Maltby Wood, Yorkshire; Windermere, Westmorland; Keswick, Cumberland; Falls of Clyde, Lanark; Port Sonachan and Barcaldine, Argyll; The Trossachs, Glen Falloch, Glen Lochay and Aberfeldy, Perthshire; Glengariff, Cork; Mangerton, Muckcross, Dromore and Turk Mt., Kerry; Addergoole, near Kylemore, Glendalough and Doughruagh Mt., Galway.

23. *B. Lightfootii* Mudd Man. 179 (1861).—Thallus determinate or subeffuse, thickish, granulose-verrucose, greenish-white or greenish-grey (K —, CaCl —). Apothecia moderate, subinnate-sessile, plane or rather convex, slightly shining, dark-brown or black, margined, the margin thin, smooth, entire or flexuose, paler; hypothecium pale-greyish; paraphyses concrete, brown at the apices; spores ellipsoid, faintly 1-septate, constricted in the middle, 9–10 μ long, 4 μ thick.—*Lichen Lightfootii* Sm. Engl. Bot. t. 1451 (1805). *Lecidea Lightfootii* Ach. Lich. Univ. 177 (1810); S. F. Gray Nat. Arr. i. 469; Hook. in Sm. Engl. Fl. v. 180; Cromb. Lich. Brit. 65; Leight. Lich. Fl. 319; ed. 3, 333.

Exsicc. Johns. n. 452; Larb. Lich. Hb. n. 106.

Somewhat similar in habit and appearance to *L. parasema*. The innate apothecia occasionally seem as if crowned by the thalline granules, which, in conjunction with their paler margin, suggests a *Lecanora*; there are, however, no traces of a true thalline margin. In some habitats (e.g. firs) the thallus is much thinner with the granules more scattered and the apothecia smaller. The spermogones are small and brown; the spermatia subglobose and very minute, 2 μ long, 1.5 μ thick.

Hab. On the smooth trunks of trees, chiefly birch, rarely fir, in upland wooded districts.—*Distr.* Not unfrequent in England, Wales, and S. Ireland.—*B. M.* Ullacombe, Dartmoor, Devon; Reigate Hill,

Surrey; St. Leonard's Forest, Ardingly Rocks, near Parham, near Petworth, near Eastham, Cuckfield, Hayward's Heath and Wiggonbolt Common, Sussex; Lyndhurst, New Forest, Hants; Tunbridge Wells, Kent; Lewknor, Oxfordshire; near Raider Du, Radnorshire; Doly-melyn and Nannau, Dolgelly, Merioneth; Baysdale, Cleveland, Yorkshire; Ravenscar and near Levens, Westmorland; New Galloway, Kirkeudbrightshire; Ormidale, Kyles of Bute; Riverstown, Cork; Dunkerron, Kerry.

Var. **commutata** Mudd l. c.—Thallus granulose-leprose or subpulverulent, greenish-grey. Apothecia as in the species.—*Lecanora commutata* Ach. Lich. Univ. 352 (1810). *Lecidea Lightfootii* var. *commutata* Schær. Enum. 138 (1850); Cromb. Lich. Brit. 65; f. *commutata* Leight. Lich. Fl. 319; ed. 3, 334.

Might perhaps be regarded as merely an old condition, characterized by the thallus becoming dissolved and pulverulent throughout. Transition states to the type are not wanting, and in otherwise typical specimens the granules are here and there deliquescent. Schærer describes the apothecia as being also carneous or reddish-brown, colours not visible in his own specimen nor in ours; they are blackish and sometimes slightly umbonate.

Hab. On the trunks of old trees, rarely on old palings, in maritime and upland tracts.—*Distr.* Rare in S. England, S. Ireland, and the Channel Islands.—*B. M.* Patrimoine, Jersey; near Parham, Sussex; Brockenhurst, New Forest, Hants; near Cirencester, Gloucestershire; Killaloe, Clare; Cahirlogue, near Glenmire, and Agharda, Cork.

24. **B. atropurpurea** Massal. Ric. Lich. 135, fig. 265 (1852).—Thallus effuse, thin, granulose-leprose, greenish-grey (K —, CaCl —). Apothecia small, appressed or adnate, plane, thinly margined, purplish- or brownish-black; paraphyses discrete, brownish at the apices; hypothecium pale; spores subellipsoid, 11–15 μ long, 5–7 μ thick; hymenial gelatine pale-bluish then deep-wine-red with iodine.—Mudd Man. 178. *Lecidea sphaeroides* var. *atropurpurea* Schær. Spicil. 165 (1833). *L. atropurpurea* Cromb. Lich. Brit. 64 (1870); Leight. Lich. Fl. 324; ed. 3, 338. *L. atropurpurascens* Nyl. in Flora lvi. 294 (1873); Leight. Lich. Fl. ed. 3, 338.

Ersice. Larb. Lich. Hb. n. 151; Johns. n. 338.

Hab. On trunks of old trees in wooded maritime and upland districts.—*Distr.* Only a few localities in S. England, Wales, and W. Ireland; not seen from Scotland.—*B. M.* Rozel, Jersey; St. Leonard's Forest and Chillington, Sussex; New Forest, Hants; near Exeter and Cockington, Devon; Selhurst, Surrey; Stanstead Park, Essex; Garth, Dolgelly, Merioneth; Gwydir Woods, Bettws-y-Coed, Denbighshire; Calder Abbey Grounds, Cumberland; Glenbower Wood, Cork; Turk Mt., Dinish, Cromaglow and Glengariff, Kerry; Lough Inagh, Connemara, Galway.

25. **B. intermixta** A. L. Sm.—Thallus determinate, thin, subgranulose-rugulose, greyish or greyish-green (K + yellow, CaCl —). Apothecia moderate, plane or somewhat convex,

brownish-black or black, the margin obtuse, thin, at length obliterated; dark within; paraphyses slender or not well discrete; epithecium slightly blackish; hypothecium reddish-brown (K + violet); spores ellipsoid or oblong, 15–18 μ long, 6–7 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea intermixta* Nyl. in Ann. Sci. Nat. sér. 4, iii. 161 (1855); Cromb. Lich. Brit. 64; Leight. Lich. Fl. 314. *L. Laureri* Leight. Lich. Fl. ed. 3, 329 (1879). *Catillaria Laureri* Hepp in Arn. exs. n. 353 (1867).

Exsicc. Johns. n. 337.

On the bark of trees, chiefly beech, rare.—*B. M.* Brockenhurst and Lyndhurst, New Forest, Hants; N. England (Northumberland and Cumberland).

26. *B. lenticularis* Koerb. Syst. Lich. Germ. 191 (1855).—Thallus thin, effuse or evanescent, brownish or greyish (K —, CaCl —). Apothecia small, adnate, reddish-brown or black, plane with a prominent margin, becoming convex and immarginate; hypothecium brownish or colourless; paraphyses stoutish, distinct, brown or blackish-brown at the capitate tips; spores oblong, small, 6–11 μ long, 2–4 μ thick; hymenial gelatine blue then wine-red with iodine.—*Lecidea lenticularis* Ach. Syn. 28 (1814)?; Cromb. Lich. Brit. 91 pro parte (excl. syn. & subsp. *nigroclavata*); Leight. Lich. Fl. 315; ed. 3, 335 (excl. f. *nigroclavata*). *L. umbrinella* Nyl. in Flora lix. 309 (1876); Cromb. in Grevillea v. 27; Leight. Lich. Fl. ed. 3, 327. *Zeora lenticularis* Flot. in Uebers. Schles. Ges. Vaterl. Cult. 124 (1850).

Exsicc. Carroll Lich. Hib. n. 22; Larb. Lich. Hb. nos. 70, 172 (as *Lecidea umbrinella*), 314; Johns. n. 394.

Distinguished by the small size of the apothecium and its contents, and especially by the almost globose tips of the paraphyses, the upper part of which is coloured dark-brown, resembling those of *Lecidea nigroclavata* which has been classified by several authors as a variety of this species, but is included in *Lecidea* on account of the constantly simple spores. Several varieties in addition to those recorded have been distinguished—var. *acrustacea* Hepp (ex Arnold in Flora xli. 502 (1858); Leight. Lich. Fl. ed. 3, 336 as form) represents a condition with evanescent thallus; var. *vulgaris* Koerb. (Par. Lich. 144 (1860); Leight. l. c. as form) as understood by Leighton differs from the type in including only those with a distinct thallus; f. *oxydata* Leight. (l. c. 336) has a ferruginous-ochraceous thallus, and is probably identical with var. *erubescens*; f. *pulicaris* Leight. (l. c. 335) has a pallid brownish thallus; it was recorded as a synonym of *Biatorina sphaeroides* by Massalongo (Ric. Lich. 136, 1852).

Hab. On rocks (rarely on branches) in maritime and upland districts.—*Distr.* Not unfrequent throughout the British Isles.—*B. M.* La Moya, Jersey; Anstey's Cove, Torquay, Devon; Bathampton Downs, Somerset; Beachy Head, Sussex; Bisley and near Cirencester, Gloucestershire; Clare Forest and Llanymynech Hill, Shropshire; Bangor and Snowdon, Carnarvonshire; St. Bees, Cumberland; Corriegills, Arran; Lismore, Argyll; Craig Guie, Braemar, Aberdeenshire;

near Cork Harbour and Rostellan, near Cork; Blackwater Bridge and Dinish, Kerry; Kilkee, Clare; Dawros River, Kylemore Lake and Lettermore, Connemara and Tully, Galway.

Form **nigricans** Arnold in Flora xliii. 74 (1860).—Thallus blackish, thin, furfuraceous, areolate, plane. Apothecia slightly larger than in the type, black.—*Lecidea lenticularis* f. *nigricans* Leight. Lich. Fl. ed. 3, 336.

The form *rimoso-areolata* (Leight. l. c.) agrees with this in the dark areolate thallus and blackish apothecia. In Larbalestier's specimen the thallus is very much broken up and located in the crevices of the rock, and is a slightly thicker state of f. *nigricans*.

Hab. On rocks.—*Distr.* W. England, Wales and W. Ireland, rare.—*B. M.* Bathampton Downs, Somerset; near Towyn, Merioneth; near Cirencester, Gloucestershire; Renvoyle, Connemara, Galway (f. *rimoso-areolata*).

Var. **erubescens** Koerb. l. c.—Thallus thin, effuse, forming white, yellowish or reddish patches. Apothecia innate then adnate, small, dark when dry, reddish-black or brownish when wet, with a blackish margin; the lower hymenium sometimes greenish-blue.—*Zeora lenticularis* var. *erubescens* Flot. l. c. *Lecidea lenticularis* f. *rhyparocarpa* Nyl. ex Leight. Lich. Fl. ed. 3, 336 (1879).

Hab. On rocks in maritime and upland districts.—*Distr.* Rare in S. and N. England, the Scottish Grampians and W. Ireland.—*B. M.* Launceston, Cornwall; Bilsdale, Yorkshire; Craig Tulloch, Blair Athole, Perthshire; Kenmare, Kerry; Kylemore, Connemara, Galway.

Var. **chloropoliza** A. L. Sm.—Thallus thin, greyish-green, unequal or wrinkled or almost evanescent. Apothecia often somewhat larger.—*Lecidea lenticularis* subsp. *chloropoliza* Nyl. in Bull. Soc. Bot. Fr. viii. 758 (1861); Carroll in Journ. Bot. v. 258 (1867); Cromb. Lich. Brit. 91; var. *chloropoliza* Leight. Lich. Fl. 316; ed. 3, 336.

Exsicc. Larb. Lich. Hb. n. 313.

Characterized by the usually more developed thallus and larger apothecia.

Hab. On granitic and schistose rocks, very rarely erratic on dead wood in maritime districts.—*Distr.* Only sparingly in the Channel Islands, N.E. Scotland and W. Ireland.—*B. M.* Sark; Boulay Bay and near St. Aubin's (lignicolous), Jersey; Cove, Kincardineshire; Kilkee, Clare.

27. **B. rhypodiza** A. L. Sm.—Thallus indeterminate, thin or very thin, subgranulate, brownish-black. Apothecia small, plane, thinly margined, blackish; paraphyses rather thick, brown at the thickened clavate apices; hypothecium colourless; perithecium brown; spores oblong, 14–16 μ long, 5–6 μ thick; hymenial gelatine bluish then wine-reddish with iodine.—*Lecidea rhypodiza* Nyl. in Flora lxiv. 5 (1881); Cromb. in Grevillea x. 23.

Resembles in outward appearance *f. nigricans* of the preceding species, but differs in the form of the paraphyses and larger spores. Spermatogones have not been seen.

Hab. On a schistose rock in an alpine situation.—*B. M.* Summit of Craig Calliach, Perthshire (the only locality).

28. *B. chalybeia* Mudd Man. 180 (1861).—Thallus sub-effuse, thin, continuous or minutely rimulose, dark-grey or leaden-black (K —, CaCl —, medulla I—); hypothallus very thin, black. Apothecia small, sessile, plane or slightly convex, margined, black, the margin thin, entire; hypothecium thickish, brownish-black; paraphyses thickish, dark brown or black at the clavate apices; spores oblong, ellipsoid, thinly 1-septate, minute, 7–10 μ long, 2.5–3.5 μ thick; hymenial gelatine deep-blue with iodine.—*B. melastigma* Mudd Man. l. c. *Lecidea chalybeia* Borr. in Engl. Bot. Suppl. t. 2687, fig. 2 (1831); Nyl. in Mém. Soc. Sci. Nat. Cherb. ii. 333 (1854); Hook. in Sm. Engl. Fl. v. 176; Cromb. Lich. Brit. 91; Leight. Lich. Fl. 312; ed. 3, 326 (incl. *f. ecrustacea*). *Lecidea melastigma* Tayl. in Mackay Fl. Hib. ii. 115 (1836); Leight. Lich. Fl. ed. 3, 331.

Exsicc. Larb. Lich. Hb. nos. 148, 149; Johns. n. 393 (*f. ecrustacea*).

Apt to be confounded with states of *B. lenticularis*, to which it is intimately related, but easily distinguished by the colour of the apothecia and more especially by the dark hypothecium and epithecium. The apothecia are usually scattered and numerous. The spermatogones are minute, semi-immersed, black, with shortly ellipsoid spermatia, 2–8 μ long, 1 μ thick. The thallus may be very reduced (*f. ecrustacea*).

Hab. On siliceous rocks and stones (rarely on wood) in maritime and upland tracts.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Noirmont, St. Aubin's and near L'Etacq, St. Ouen's Bay, Jersey; Patcham, Aldrington Beach, near Brighton and the South Downs, Sussex; Lamynack Carne, near Penzance, Cornwall; Chesil Beach, Abbotsbury, Dorset; Blue Anchor, Somerset; Fishguard Harbour, Pembrokeshire; Trefriw Falls, Carnarvonshire; Bilsdale, Yorkshire; St. Bees, Cumberland; Ben Lawers, Perthshire; Portlennen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire; near Cork; Dunkerron, Kerry; near Kylemore, Letterbeg and Glencorbot, Connemara, Galway.

Subsp. *chloroscotina* A. L. Sm.—Thallus more deeply cracked, greyish-green. Apothecia somewhat plane and wrinkled when old; hypothecium brownish-black, the hymenium bluish (K + violet); spores 1-septate, sometimes simple, 8–16 μ long, 3–4 μ thick, hymenial gelatine bluish then tawny-reddish with iodine. Spermatogones and spermatia as in the species.—*Lecidea chloroscotina* Nyl. in Flora lx. 565 (1877) & lxv. 456 (1882); Cromb. in Grevillea vi. 113; Leight. Lich. Fl. ed. 3, 352 pro parte.

Exsicc. Larb. Lich. Hb. n. 180.

Distinguished from the species by the thicker more deeply cracked thallus and the somewhat large spores, which are sometimes simple.

Hab. On moist siliceous stones in streams.—*Distr.* Very local, though common where it occurs in W. Ireland and (*vide* Nylander) in N.W. England (Kentmore, Westmorland).—*B. M.* Between Lough Feagh and Lough Muck, Connemara, Galway.

29. **B. dolosa** A. L. Sm.—Thallus determinate, thin, minutely granular, olive or tawny-olive-brown. Apothecia minute, plane, dark-brown, with a thin paler margin, becoming somewhat convex and immarginate; hypothecium colourless; paraphyses slender, brown at the clavate apices; spores ellipsoid, 11–12 μ long, 5–6 μ thick; hymenial gelatine bluish then dark-violet with iodine.—*Lichen dolosus* Sm. Engl. Bot. t. 2581 (1814) (non Ach.). *Lecidea Gagei* Hook. in Sm. Engl. Fl. v. 177 (1833); Tayl. in Mackay Fl. Hib. ii. 120. *L. lenticularis* var. *Gagei* Cromb. in Journ. Bot. ix. 179 (1871).

An interesting plant hitherto rightly defined only by Nylander (Flora vii. 308 (1874) as *Lecanora elæiza*), but later (Flora lxi. 248 (1878)) he states that it is identical with *L. lenticularis* (Leight. Lich. Fl. ed. 3, 546). In the original specimen the thallus is in small rotundate detached patches, limited by a paler fibrillose hypothallus; but in a subsequent specimen from Sir Thomas Gage, the thallus is much better developed and more contiguous, with the hypothallus less visible. The apothecia are chiefly central and not numerous. The spermogones, sparingly visible, have the spermatia (*vide* Nyl. l. c.) minute, oblong, 2.5 μ long, 1 μ thick, on septate somewhat turgid sterigmata.

Hab. On a rock in an upland tract of a mountainous region.—*Distr.* Found only very sparingly in S.W. Ireland (recently also in Hungary).—*B. M.* Killarney, Kerry.

30. **B. columnatula** A. L. Sm.—Thallus indeterminate, sordid-yellow, composed as it were of small erect connate columns and divided into areolæ (K + yellow). Apothecia superficial, black, small, somewhat plane and obtusely margined, becoming immarginate, whitish or yellowish within; paraphyses not well discrete; epithecium and perithecium blackish; spores oblong, 12–16 μ long, 4 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*Lecidea columnatula* Nyl. in Flora lx. 228 (1877); Cromb. in Grevillea vi. 19; Leight. Lich. Fl. ed. 3, 332. Specimen not seen.

Well characterized by the columnar thallus. The spermogones have branched sterigmata and minute spermatia, 3.5 μ long, .6 μ thick.

Hab. On a schistose rock in a maritime district. Collected by Larbalestier at Kylesmore, Connemara, Galway.

31. **B. biformigera** A. L. Sm.—Thallus dirty-greenish-white, tartareous, thick, tumid, warted-areolate, variously cracked (K + yellow, CaCl + yellow). Apothecia black or bluish-black, small and conglomerate, plane and slightly margined, or large, sessile with a thickish flexuose margin; hypothecium colourless or brownish, the hymenium often pale-bluish upwards; paraphyses distinct, blackish at the tips; spores narrowly oblong, 1-septate,

the cells biguttulate, 14–15 μ long, 4–5 μ thick; hymenial gelatine blue with iodine.—*Lecidea biformigera* Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. 403 (1867) & Lich. Fl. 321; ed. 3, 332; Cromb. Lich. Brit. 90.

Exsicc. Larb. Lich. Hb. n. 105; Johns. n. 392.

Form *subbiformata* (Nyl. ex Leight. Lich. Fl. ed. 3, 333 (1879)) differs from the type in the somewhat plane areolæ of the thallus.

Hab. On maritime and alpine rocks.—*Distr.* Somewhat rare in the Channel Islands, central and N. England and W. Ireland, more frequently found in Wales, evidently very rare in Scotland.—*B. M.* Alderney; Longmynd, Shropshire; Tenby, Pembrokeshire; Llyn Aran, Moel Gader, Dolgelly and Cader Idris, Merioneth; Llandbedrog and Snowdon, Carnarvonshire; Beston Sear and Shap, Westmorland; Whitehaven and Bassenthwaite, Cumberland; Colvend, Kirkeudbright; Doughruagh Mt. and Lough Feagh, Connemara, Galway; Louisburgh, Mayo.

32. **B. lutosa** Jatta Syll. Lich. Ital. 381 (1900).—Thallus dirty-ochraceous, tartareous, cracked-areolate, the areolæ plane, sometimes minutely lobate (K —, CaCl —). Apothecia black; innate and immarginate, then appressed, plane, with a thin prominent margin; hypothecium black; paraphyses distinct, thicker and blackish at the tips; spores oblong or ovoid, rather small, 10–12 μ long, 5–6 μ thick.—*Lecidea lutosa* Mont. ex Schær. Enum. 116 (1850); Mudd Man. 202; Cromb. Lich. Brit. 78; Leight. Lich. Fl. 311; ed. 3, 326.

Specimens in the Anzi and Hepp herbarium correspond well with the description, but the spores are rather variable; Jatta gives the sizes as 12 $\mu \times 2\text{--}4 \mu$.

Hab. On rocks in upland regions.—*Distr.* Somewhat rare. Recorded from Devon, Shropshire and Yorkshire.

33. **B. contristans** A. L. Sm.—Thallus effuse, thin, granulose, brown or dark-brown (K —, CaCl —). Apothecia small, convex, immarginate, black, dark within; hypothecium sordid; paraphyses coherent; epithecium blackish; spores ellipsoid or oblong, 10–14 μ long, 4–6.5 μ thick; hymenial gelatine bluish then sordid-yellow with iodine.—*Lecidea contristans* Nyl. in Flora xlviii. 354 (1865); Leight. in Ann. Mag. Nat. Hist. ser. 3, xvii. 62 (1866) & Lich. Fl. 312; ed. 3, 329; Cromb. Lich. Brit. 72. *L. holomeloides* Nyl. in Flora xlix. 369 (1866); Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. 330 (1867) & Lich. Fl. 323; ed. 3, 333; Cromb. Lich. Brit. 70. *L. anomaloides* f. *denigrans* Nyl. ex Cromb. Lich. Brit. 70; Leight. Lich. Fl. 315; ed. 3, 330.

Exsicc. Cromb. n. 177.

The hypothecium varies from almost colourless in a thin section to sordid-brownish; the epithecium is greenish-black or sordid-brown.

Hab. Overspreading decaying mosses on the ground or on rocks in alpine situations.—*B. M.* Helvellyn, Cumberland; near the summit

of Ben Lawers, Perthshire; summit of Ben Nevis and Larig Ghru, Invernesshire.

34. **B. confusior** A. L. Sm. — Thallus effuse, dark-grey, thin, cracked-areolate, the areolæ small, almost plane. Apothecia rather small, black, plane and obscurely margined, becoming convex or almost globose and immarginate; hypothecium colourless or yellowish; paraphyses not well discrete, rather stout, slightly thicker and blackish at the apices; spores ellipsoid or oblong, simple, then 1-septate, 10–17 μ long, 4–6 μ thick; hymenial gelatine deep blue then wine-red with iodine.—*Lecidea confusior* Nyl. in Flora lvii. 315 (1874); Cromb. in Grevillea iii. 24; Leight. Lich. Fl. ed. 3, 298.

Described by Nylander as having simple spores and as closely allied to *Lecidea confusula*. Examination of the specimen in the British Museum from the original locality and determined by Nylander shows that the spores are septate when mature.

Hab. On mica-schist rocks in a mountainous district.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

35. **B. obturbans** A. L. Sm.—Thallus indeterminate, thin, rugose, unequal, greyish (K + yellowish, CaCl —); hypothallus black, limiting the thallus. Apothecia small, at first plane and thinly margined, becoming convex and immarginate, blackish, pale within; paraphyses not well discrete; epithecium and perithecium blackish; spores oblong, colourless, 10–11 μ long, 3.5 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea obturbans* Nyl. in Flora lxi. 100 (1886); Martindale in Naturalist, 1886, 101.

Not unlike *B. biformigera* in its thick unequal thallus. It differs in the darker hypothecium and in the compact paraphyses.

Hab. On schistose rocks.—*B. M.* Winster, near Kendal, Westmorland.

36. **B. subviridis** A. L. Sm.—Thallus effuse, thin, continuous, or granulate-rugulose, somewhat shining, greenish or dark-green (K —, CaCl —). Apothecia sessile, minute, plane, thinly margined, black, whitish within; paraphyses moderate; epithecium brown; hypothecium colourless; spores oviform, 11–16 μ long, 5–7 μ thick; hymenial gelatine bluish then tawny-reddish with iodine.—*Lecidea subviridis* Nyl. in Flora lvi. 297 (1873); Cromb. in Grevillea ii. 91; Leight. Lich. Fl. ed. 3, 331.

Exsicc. Cromb. n. 177

Well characterized by the *Arthonia*-like spores; it is allied to *Lecidea arthoniza*, a Scandinavian species. In the two small specimens seen, the apothecia are only sparingly present.

Hab. On siliceous stones in a maritime district.—*B. M.* Noirmont Bay, Jersey (the only locality).

Living on other Lichens.

Most of the following species have been classified under *Scutula*, a genus of Discomycetes by Rehm, Zopf and finally by Vouaux in Bull. Soc. Mycol. Fr. xxix. 419 (1913). They are retained here, as the fructification is lichenoid in character. It is doubtful if they are truly parasitic.

37. **B. supernula** A. L. Sm.—Thallus absent. Apothecia small, plane, and thinly margined, at length convex, immarginate, black; hypothecium bluish-black, brick-red above; paraphyses moderate or rather thick, bluish-black at the clavate apices; spores oblong-oviform, 9–14 μ long, 4–5 μ thick; hymenial gelatine wine-red with iodine.—*Lecidea supernula* Nyl. in Flora lix. 574 (1876); Cromb. in Grevillea v. 107; Leight. Lich. Fl. ed. 3, 389.

An athalline plant very similar in the form of the *Arthonia*-like spores to the *Biatorinia subviridis*. The apothecia are numerous and usually several (3–6, rarely 8) aggregate.

Hab. Parasitic on the thallus of *Lecanora calcarea* var. *Hoffmanni* in a maritime tract.—*B. M.* Island of Lismore, Argyll (the only locality).

38. **B. episema** A. L. Sm.—Thallus absent. Apothecia small, black, aggregate or solitary, plane or rarely convex, marginate, the margin obtuse, entire; hypothecium brown; paraphyses distinct, blackish at the tips of the clavate apices; spores ellipsoid or elongate-oblong, typically 1-septate, rarely 1–3-septate, 10–18 μ long, 4–5 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea episema* Nyl. in Bot. Not. 1853, 161; Cromb. Lich. Brit. 78; Leight. Lich. Fl. 356; ed. 3, 385.

Hab. Parasitic on the thallus of *Lecanora calcarea*.—*Distr.* Somewhat rare though widely distributed in the British Isles.—*B. M.* Near Yatton, Somerset; Barnsley Park and Cirencester, Gloucestershire; Aran Mawddwy, Merioneth; Trefriw and Great Orme's Head, Carnarvonshire; I. of Lismore, Argyll; Craig Tulloch, Blair Athole, Perthshire; Cong, Lough Corrib and near Ballinakill, Galway.

39. **B. cristata** A. L. Sm.—No proper thallus. Apothecia black, very minute, solitary, or clustered, or in narrow flexuose lines, concave, the margin thick and obtuse; hypothecium black, carbonaceous; spores linear-oblong, minute, faintly 1-septate, 6–8 μ long, 2–3 μ thick.—*Lecidea cristata* Leight. Lich. Fl. 356 (1871); ed. 3, 385. Specimen not seen.

Hab. Parasitic on the thallus of *Lecanora subcarnea*.—*Distr.* Rare, recorded only from Wales (Barmouth, Merioneth).

40. **B. stereocaulorum** Th. Fr. Lich. Arct. 188 (1860).—Thallus absent. Apothecia parasitic, small, plane, at length convex, immarginate, black, blackish or pale, dark within;

paraphyses clavate and yellowish-brown at the apices; hypothecium somewhat yellowish; spores oblong-fusiform (usually thicker above), 13–19 μ long, 4–6 μ thick; hymenial gelatine tawny-wine-red, the asci bluish and then violet at the apices, with iodine.—*Lecidea stereocaulorum* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 182 (1866); Cromb. in Grevillea xxii. 11.

Hab. On the squamules of *Stereocaulon* in mountainous regions.

41. **B. epiblastematica** A. L. Sm.—Thallus effuse, thin, scattered, minutely granulate, whitish or obsolete. Apothecia small, at first subplane with paler margin, then convex and immarginate, sordid-pale-brown, at length blackish: paraphyses slightly incrassate at the apices; hypothecium colourless or brownish; spores fusiform-ellipsoid or ovoid, simple or 1-septate, 12–15 μ long, 5–7 μ thick; hymenial gelatine pale-bluish then wine-red with iodine.—*Peziza epiblastematica* Wallr. Fl. Crypt. Germ. ii. 464 (1833), *vide* Arnold ex Rehm in Rabenhorst's Krypt.-Fl. i. 3, 323 (1890). *Scutula Wallrothii* Tul. in Ann. Sci. Nat. sér. 3, xvii. 119, t. 14, figs. 14–24 (1852). *Biatora Heerii* Hepp in Schær. Lich. Helv. n. 630 (1852). *Lecidea Heerii* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 150 (1866); Cromb. in Journ. Bot. xx. 275 (1882). *L. Wallrothii* Nyl. l. c.; Cromb. in Journ. Bot. xii. 148 (1874); Leight. Lich. Fl. ed. 3, 388.

In the few British specimens the thallus described by Nylander is entirely absent. The parasitic apothecia are either solitary or more frequently aggregate on the host. Small brick-red pycnidia also occur with oblong straight or slightly arcuate simple or 1-septate stylospores, 14–23 μ long, 4 μ thick (Nyl. Lich. Env. Paris, Suppl. 6 (1897)).

Hab. On the thallus of species of *Peltigera* and on *Solorina saccata* in hilly or alpine districts.—*B. M.* Craig Calliach and Ben Lawers, Perthshire.

76. **BILIMBIA** De Not. in Giorn. Bot. Ital. Ann. 2, I. 190 (1846); Mudd Man. 187. (Pl. 10.)

Thallus minutely squamulose or variously crustaceous, some times obsolete. Algal cells, Protococcaceæ. Apothecia light coloured or dark and carbonaceous, immarginate or with a proper margin only; spores usually 8 in the ascus, oblong or fusiform, 2- to pluri-septate, usually 3-septate, colourless.

Thallus more or less squamulose.

1. **B. caradocensis** A. L. Sm.—Thallus effuse, minutely squamulose-granulose, rimose-areolate, pale-greyish- or greenish-olive (K + yellow, CaCl + orange-yellow), the squamules adnate, convex, crowded, somewhat rugose, more or less crenulate at the margins. Apothecia very small, innate-sessile, margined, black, the margin thick, flexuose; hypothecium reddish- or dark-brown;

paraphyses concrete, brown at the apices; spores ellipsoid-fusiform, 3-septate, 11–15 μ long, 4–5 μ thick; hymenial gelatine bluish with iodine.—*Lecidea caradocensis* Leight. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, 383 (1856); Leight. in Ann. Mag. Nat. Hist. ser. 3, xiv. 404, t. 9, figs. 6, 7, 10 (1864) & Lich. Fl. 325; ed. 3, 344; Cromb. Lich. Brit. 92. *Psora caradocensis* Mudd Man. 169 (1861) pro parte.

Exsicc. Leight. n. 160; Cromb. n. 93; Johns. n. 395; Mudd n. 142?

Externally resembling *Lecidea Friesii*. It is frequently sterile; the apothecia when present are numerous and often confluent and difform. The immature spores are sometimes only 1- or 2-septate. Mudd's specimen n. 142 is too imperfect for accurate determination.

Hab. On trunks of firs, more frequently on old palings.—*Distr.* Local but plentiful in S. and central England, rare in N. England.—*B. M.* Near Lyndhurst, Hants; Penshurst, Kent; near Reigate, Surrey; Hendon and near Mill Hill, Middlesex; near High Beach, Epping Forest, Essex; Chalford, Gloucestershire; Windsor Great Park, Berkshire; near Elstree, Herts; Gopsall and Twycross, Leicestershire; near Upper Howell, Malvern, Worcestershire; the Wrekin and Caer Caradoc, Shropshire; Park End, Wark-on-Tyne, Northumberland.

2. *B. aromatica* Jatta Syll. Lich. Ital. 402 (1900).—Thallus indeterminate, thickish, globulose-squamulose or granulose-congested, rugose, greyish-white (K —, CaCl —). Apothecia small, sessile, plane and thinly margined, at length convex and immarginate, black; hypothecium thick, reddish-brown, reddish-black in thick section; paraphyses somewhat lax, clavate and dark-greenish-blue at the apices; spores oblong-cylindrical, simple or thinly 3-septate, 13–25 μ long, 4–6 μ thick; hymenial gelatine deep-blue then wine-red with iodine.—*Lichen aromaticus* Turn. in Sm. Engl. Bot. t. 1777 (1807). *Lecidea aromatica* Ach. Lich. Univ. 168 (1810); S. F. Gray Nat. Arr. i. 464; Hook. in Sm. Engl. Fl. v. 177; Cromb. Lich. Brit. 78 pro parte; Leight. Lich. Fl. 332; ed. 3, 352. *L. cæruleonigricans* var. β *aromatica* Tayl. in Mackay Fl. Hib. ii. 131 (1836)? *Toninia aromatica* Massal. Symm. Lich. 54 (1855); Mudd Man. 174, t. 3, f. 64.

Exsicc. Johns. n. 343; Leight. n. 154; Larb. Cæsar. n. 85 & Lich. Hb. n. 352; Cromb. n. 180.

The name *aromatica* was given by Turner on account of the supposed fragrant scent of the plant when bruised, which, however, is a mistake. At times the thallus occurs in small scattered patches; the apothecia are often confluent and difform. The var. *hypnophila* Nyl. ex Cromb. Lich. Brit. 78 (1870); Leight. *ll.c.* wrongly printed *hypnophila*, has a somewhat less developed thallus; it is found on rocks in alpine and maritime situations.

Hab. On the ground among calcareous rocks and on mortar of old walls in maritime and upland tracts.—*Distr.* Not unfrequent in England, rare in Scotland, Ireland, and the Channel Islands.—*B. M.*

St. Aubin's Harbour, Jersey; Port Gorey, Sark; I. of Wight; Torquay and Bolt Head, Devon; near Penzance, Cornwall; Bathampton Hill, Somerset; Shoreham and Tillington, Sussex; Lechlade and Hempstead, Gloucestershire; Barmouth, Merioneth; Trefriw, Carnarvonshire; Oswestry, Llanymynech Hill and Llanforda, Shropshire; Tenby, Pembrokeshire; Anglesea; near Yarmouth, Norfolk; near Roseberry and Ayton, Cleveland, Yorkshire; Teesdale, Durham; Whitbarrow, Reston Hall and near Barton, Northumberland; Whitehaven, Cumberland; near Appin House, Argyll; Craig Tulloch and Ben Lawers, Perthshire; Craig Guie, Braemar, Aberdeenshire; Cloghan near Kylemore, Connemara, Galway; Castlebar, Mayo.

3. *B. carbonacea* Jatta Syll. Lich. Ital. 403 (1900).—Thallus brownish-black, suborbicular, rather thick, formed of minute convex entire or crenate wrinkled squamules, sometimes cracked-areolate. Apothecia small, black, solitary or aggregate, sessile with a prominent margin, becoming immarginate; hypothecium thick, reddish-black; paraphyses distinct, brownish or greenish-black at the clavate apices; spores linear-oblong, straight or curved, 3-septate, 15–22 μ long, 4 μ thick.—*Toninia carbonacea* Anzi Cat. Lich. Sondr. 68 (1860). *Lecidea aromatica* subsp. *carbonacea* Cromb. Lich. Brit. 78 (1870). *L. carbonacea* Leight. Lich. Fl. 331 (1871); ed. 3, 351.

Differs from *B. aromatica* in the form and colour of the thallus, and in the darker-coloured epithecium.

Hab. On rocks.—*Distr.* Rare in mountainous regions in N. England, N. Scotland and W. Ireland.—*B. M.* Orton Scar, Cunswick Scar and Haverbrack, Westmorland; Ben Lawers, Perthshire; Achosragan Hill, Appin, Argyll; Craig Guie, Braemar, Aberdeenshire.

4. *B. squamulosa* A. L. Sm.—Thallus subdeterminate, thick or thinnish, squamulose, appressed, pale- or tawny-brown; squamules small, subimbricate, angular, crenate at the margins (K —, CaCl —). Apothecia small, innate-sessile, at first plane and thinly margined, then convex and immarginate, black; paraphyses slender, bluish-black at the slightly clavate apices; hypothecium thick, reddish-black; spores fusiform-cylindrical, 3-septate, 15–18 μ long, 4–5 μ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*Toninia squamulosa* Mudd Man. 174 (1861). *Lecidea squamulosa* Deakin ex Mudd l. c.; Cromb. Lich. Brit. 79; Leight. Lich. Fl. 331; ed. 3, 353.

Ersicc. Larb. Lich. Hb. n. 181 (as *Lecidea aromatica*).

Found originally by Salwey and partly described without name in Trans. Penzance Nat. Hist. Soc. 1853, 144, where he says that in age the squamules become flat, noncrenate, and lighter in colour. The numerous apothecia are either solitary or several congregate.

Hab. On rocks, walls, and the soil in crevices, in maritime rarely upland hilly districts.—*Distr.* Rather local in England, rare in N.E. Scotland, Ireland, and the Channel Islands.—*B. M.* Port Gorey, Sark; above Anstey's Cove, Torquay, and near Kingsbridge, Devon; near

Truro, near Trengwainton, and at Madron Union, Penzance, Cornwall; Bathampton Hill, Somerset; Hastings, Sussex; Malvern Hills, Worcestershire; Barmouth, Merioneth; Craigforda and Llanymynech, Shropshire; Slaghead Kirk, near Stonehaven, Kincardineshire; Craig Tulloch, Blair Athole, Perthshire; Blackwater, Kerry; Lettermore, Connemara, Galway.

5. **B. mesoidea** A. L. Sm.—Thallus subdeterminate, subopaque, unequal, minutely squamulose or subareolate-rimose, greyish or greyish-brown (K —, CaCl —). Apothecia moderate, at first thinly margined, then convex, immarginate, black; paraphyses slender, blackish at the clavate apices; hypothecium thick, reddish-black, the inner layer of perithecium and base of hymenium yellowish-red; spores oblong, 3-septate, 14–20 μ long, about 4–6 μ thick; hymenial gelatine bluish then violet-coloured with iodine.—*Lecidea mesoidea* Nyl. in Flora li. 475 (1868); Leight. in Ann. Mag. Nat. Hist. ser. 4, iii. 268 (1869) & Lich. Fl. 333; ed. 3, 350; Cromb. Lich. Brit. 78. *L. subimbricata* Nyl. in Flora lx. 460 (1877); Cromb. in Grevillea vi. 112; Leight. Lich. Fl. ed. 3, 350.

Exsicc. Johns. n. 428.

Intimately related to the preceding, but differs in the more crustaceous thallus, the darker epithecium and the rather thicker spores. According to Nylander it approaches *Lecidea acclinis* Flot., a corticolous plant not found in Britain. In our specimen of *L. subimbricata* the thallus is thicker and generally darker owing to the presence of some blue-green alga; the specimen was collected in a moist situation.

Hab. On rocks in maritime and upland localities.—*Distr.* Found only very sparingly in the Channel Islands, S. Wales, and N.W. Ireland.—*B. M.* Fliquet Bay, Jersey; Sark; Cleadon Quarries, Durham; Killery Bay and Kylemore Lake, Connemara, Galway.

6. **B. leucophæa** A. L. Sm.—Thallus determinate, thickish, granulose-squamulose, the squamules small, more or less concrescent and crenate-lobulate, greyish-white, greyish-brown, or cream-coloured (K —, CaCl —). Apothecia sessile, aggregate, at first somewhat plane and thinly margined, at length hemispherical and immarginate, blackish-brown or black; paraphyses concrete, bluish-green at the apices; hypothecium brownish-black; spores ellipsoid or oblong-fusiform, 1–3-septate, 14–24 μ long, 3–6 μ thick; hymenial gelatine bluish then sordid-violet with iodine.—*B. sabulosa* Massal. Ric. Lich. 122, fig. 239 (1852); Mudd Man. 188. *Lichen leucophæus* Dicks. Pl. Crypt ii. 20 (1790)?; With. Arr. ed. 3, iv. 28 (1796) *fide* Crombie in Grevillea xii. 61 (1883). *Lecidea sabuletorum* var. *syncomista* Floerke in Berl. Mag. 310 (1808); f. *syncomista* Cromb. Lich. Brit. 71 (1870). *L. milliaria* var. *syncomista* Leight. Lich. Fl. 339 (1871); ed. 3, 362. *L. syncomista* Cromb. in Grevillea i. 172 (1873).

Exsicc. Larb. Cæsar. n. 82 & Lich. Hb. n. 315; Cromb. n. 176.

Hab. On sandy ground and on soil in crevices of rocks in maritime and upland tracts.—*Distr.* Local and scarce in England, Wales, and the Channel Islands; more frequent on the Grampians, Scotland; not seen from Ireland.—*B. M.* Quenvais, Jersey; Cavenham Heath, Suffolk; Thetford Warren, Norfolk; Black Dale, near Buxton, Derbyshire; Cader Idris, Merioneth; Pentregaer, Oswestry, Shropshire; Achosragan Hill, Appin and I. of Lismore, Argyll; Craig Calliach, Loch-na-gat, Ben Lawers and Craig Tulloch, Perthshire; Craig Guie and Morrone, Braemar, Aberdeenshire; Achill Sound, Mayo.

Var. *perpallescens* A. L. Sm.—Thallus squamulose, greyish-white, the squamules paler at the margins. Apothecia pale or pale-brick-red.—*Lecidea syncomista* subsp. *perpallescens* Nyl. in *Flora* lxii. 361 (1879); *Cromb.* in *Grevillea* viii. 114.

Differs from the species in the constantly paler thallus and apothecia.

Hab. On the soil in crevices of calcareous rocks in a maritime district.—*B. M.* I. of Lismore, Argyll.

Var. *montana* A. L. Sm.—Thallus effuse, thin, greyish or whitish, granulose. Apothecia aggregate, immarginate; hypothecium thick, black; paraphyses dark-bluish-green or black; otherwise as in the species.—*Lecidea vernalis* var. *montana* Nyl. in *Act. Soc. Linn. Bord. sér. 3*, i. 354 (1856). *L. sabuletorum* f. *montana* Nyl. *Lich. Scand.* 205 (1861); *Cromb. Lich. Brit.* 71. *L. milliaria* var. *montana* Leight. *Lich. Fl.* 339 (1871); ed. 3, 362 *pro parte*.

Differs from the species in the thinner more finely granular thallus, and the internally blacker apothecia.

Hab. On the ground incrusting mosses.—*Distr.* Rare in alpine situations.—*B. M.* Ben Lawers, Perthshire; Cairn Gorm and Pen-naboord, Aberdeenshire.

7. *B. squalida* Jatta *Syll. Lich. Ital.* 403 (1900).—Thallus subdeterminate, squamulose-concrescent, plicate-wrinkled, the squamules sublobulate, often pulvinate, tawny, or greyish-brown (K —, Catl —). Apothecia small, adnate, plane and thinly margined, then convex and immarginate, black; hypothecium colourless or brownish; paraphyses loosely coherent, dark-brown or greenish-blue at the clavate or subcapitate apices; spores cylindrical or fusiform-cylindrical, simple or 3-septate, 18–36 μ long, 4–5 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lichen squalidus* Schleicher in *Schrad. Neu. Journ. Bot.* i. 2, 199 (1806) (nomen). *Lecidea squalida* Ach. *Lich. Univ.* 169 (1810); *Cromb.* in *Journ. Bot.* xi. 134 (1873); Leight. *Lich. Fl.* ed. 3, 358.

The thallus varies in thickness and sometimes occurs in small orbicular patches; the apothecia are numerous and become subglobose and conglomerate.

Hab. On mosses chiefly *Andreæas*, and on calcareous soil in

mountainous regions.—*Distr.* Rare on the Grampians, Scotland.—*B. M.* Above Loch-na-gat, Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Barcaldine, Argyll.

8. **B. Turneri** A. L. Sm.—Thallus glaucous-white, tartareous, warted-areolate, turgid, sublobate (K —, CaCl —). Apothecia minute, solitary or confluent, sessile, black, plane or convex, marginate; hypothecium thick, black; spores linear-cylindrical or fusiform, 3-septate sometimes 2- or 4-septate, 15–16 μ long, 3.5 μ thick.—*Lichen candidus* Sm. Engl. Bot. t. 1138 (1803) (non Weber). *Lecidea Turneri* Leight. Lich. Fl. 330 (1871); ed. 3, 353.

I have examined the specimen of *Lichen candidus* in the Sowerby herbarium, said by Leighton to be synonymous with his *L. Turneri*, and have been unable to find spores; the hypothecium is thick and dark, becoming a greenish-brown colour in the hymenium; the paraphyses are slender and closely coherent.

Hab. On mortar in walls, etc.—*Distr.* S. and central England.—*B. M.* Near Yarmouth, Norfolk.

9. **B. leucophæopsis** A. L. Sm.—Thallus minutely or indistinctly granulate-squamulose, whitish-grey, the squamules small roundish irregular, adnate and depressed in the centre, scattered, or contiguous and divided into areolae (K + yellow, CaCl —). Apothecia moderate or somewhat large, sessile, plane or subconvex, brownish-black, opaque; hypothecium and epithecium yellow- or dark-brown; paraphyses very slender, loosely coherent; spores fusiform, 3–5-septate, 24–34 μ long, 5–8 μ thick; hymenial gelatine bluish, the asci at length wine-reddish with iodine.—*Lecidea leucophæopsis* Nyl. in Flora lvi. 20 (1873); Cromb. in Grevillea i. 141; Leight. Lich. Fl. ed. 3, 364.

Crombie states that the thallus is not uncommon on Ben Lawers, but fructifications are rare. It is usually associated with a blue-green alga, *Stigonema saxicola*.

Hab. On quartzose stones.—*B. M.* Ben Voirlich and Ben Lawers, Perthshire.

10. **B. cambrica** Wheld. in Journ. Bot. lviii. 15 (1920).—Thallus yellowish-grey, subeffuse, squamulose; squamules roundish and nodulose or larger and irregularly flexuose, adnate depressed in the centre, the margins elevated, whitish. Apothecia rather small, black, opaque, scattered or several together, becoming convex, tuberculate and immarginate; hypothecium black, becoming brown upwards; paraphyses discrete, slender, subcapitate, the epithecium brown; spores fusiform, 3–5-septate, 24–36 μ long, 5–7 μ thick. Specimen not seen.

Considered by Wheldon to be closely related to a variety of *B. leucophæopsis*. It also is associated with *Stigonema saxicola*.

Hab. On rocks of volcanic ash, Snowdon (3000 ft.), Carnarvonshire.

Thallus crustaceous.

(a) Apothecia light-coloured at first.

11. **B. sphæroides** Koerb. Syst. Lich. Germ. 213 (1855) excl. syn. —Thallus effuse, granulose-subpulverulent, greyish- or greenish-white (K —, CaCl —). Apothecia moderate, sessile, pale-yellow, at first plane with thickish paler margin, at length convex, subglobose, immarginate; hypothecium pale; paraphyses concrete, colourless or very pale-yellowish; spores oblong-fusiform or obtuse, 3-septate, 15–21 μ long, 5–7 μ thick; hymenial gelatine pale-bluish then deep wine-red with iodine. —*Lichen sphæroides* Dicks. Crypt. fasc. i. 9, t. 2, f. 2 (1785); With. Arr. ed. 3, iv. 15. *Lecidea sphæroides* Sommerf. Suppl. Fl. Lapp. 164 (1826); S. F. Gray Nat. Arr. i. 474; Cromb. Lich. Brit. 70; Leight. Lich. Fl. 336; ed. 3, 357. *Biatorina sphæroides* Mudd Man. 177 (1861). Massal. Ric. Lich. 135 (1852).

There is a wide variation in the form and septation of the spores, from short, 1-septate and almost pyriform to oblong, narrowly fusiform and 3- or rarely 5-septate, hence the confusion between *Biatorina* and *Bilimbia*.

Hab. On trees, on mosses on trees, and on the ground. —*Distr.* Rare throughout the British Isles. —*B. M.* St. Minver, Cornwall; Henfield, Sussex; Cliffrigg, Cleveland, Yorkshire; Ben Lawers, Perthshire; Craig Cluny, Braemar, Aberdeenshire; Letterfrack, Connemara, Galway.

Var. **alabastrites** A. L. Sm. —Thallus effuse, thin, continuous, minutely subgranulose, whitish or greenish-white. Apothecia small, somewhat plane, whitish, colourless within, the margin scarcely prominent, somewhat paler; paraphyses not discrete; epithecium and hypothecium colourless; spores fusiform, 3–5-septate, 18–24 μ long, 5–7 μ thick; hymenial gelatine bluish then, especially the asci, dark-wine-coloured with iodine. —*Lecidea alabastrites* Nyl. in Flora lxii. 207 (1879); Cromb. in Grevillea viii. 29.

Ersicc. Larb. Lich. Hb. without number.

Resembles the species in external appearance, differing only in the somewhat more regular and larger spores, usually 3- or more-septate. In the specimen examined from the original locality the apothecia are somewhat yellow internally, but that is probably only a condition of age or growth.

Hab. On moss on trees. —*B. M.* Derryclare, Kylemore, Connemara, Galway.

12. **B. Nægelli** Anzi in Flora xlv. 653 (1861). —Thallus effuse, thin, unequal, granulose or rimulose, greyish or whitish (K —, CaCl —). Apothecia minute, adnate or sessile, subconcave or plane and thinly margined, then convex and immarginate,

leaden-brownish or flesh-coloured; hypothecium pale; paraphyses coherent, leaden-brownish or dark at the apices; spores 6-8 in the ascus, oblong, straight or slightly curved, simple or usually 3-septate, 14-25 μ long, 4-6 μ thick; hymenial gelatine bluish then sordid-tawny-wine-coloured with iodine.—*Biatora Nægelii* Hepp Flecht. Eur. n. 19 (1853). *Lecidea Nægelii* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxiv. Abh. 2, 19 (1867); Cromb. in Journ. Bot. xiv. 361 (1876); Leight. Lich. Fl. ed. 3, 345. *L. sphaeroides* f. *vacillans* Nyl. Lich. Scand. 204 (1861) pro parte; Leight. Lich. Fl. 336.

Exsicc. Larb. Lich. Hb. n. 175.

When moistened the apothecia show a pale transparent disc, surrounded by a darker ring.

Hab. On the bark of trees.—*Distr.* Rare in S. England and W. Ireland.—*B. M.* Chilworth, Surrey (?); Somerton, Oxfordshire; near Erriff, Connemara, Galway.

13. **B. metamorphea** Oliv. Exp. Syst. Lich. France ii. fasc. 1, 40 (1900).—Thallus effuse, thin, leprose, greenish or greyish-green. Apothecia small or submoderate, innate, somewhat plane, at times difform or 2-confluent, the margin obliterated, whitish or pale-flesh-coloured, concolorous within; asci oblong, crowded; paraphyses none; spores oblong or oblong-fusiform simple or 3-septate, 19-32 μ long, 6-8 μ thick; hymenial gelatine scarcely tinged, the asci bluish then wine-reddish, with iodine.—*Lecidea metamorphea* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 359 (1856); Cromb. in Grevillea i. 172; Leight. Lich. Fl. ed. 3, 355.

The peculiar character of this lichen is the absence of paraphyses. The asci are very thick-walled and in the specimen from Wrexham (D. A. Jones) fine branching hyphæ coil over and between the asci. The material from Glen Fender (Crombie) is very scanty, but the asci are thick-walled, closely packed, and the paraphyses absent or obscured. The hymenial gelatine changes from blue to violet with iodine.

Hab. On mosses on stones, in a mountainous district.—*B. M.* Near Wrexham, Denbigh; Glen Fender, Blair Athole, Perthshire.

14. **B. hyalinescens** Boist. Nouv. Fl. Lich. pt. 2, 188 (1902).—Thallus effuse, very thin, subfurfuraceous, greyish-white, at times scarcely distinct. Apothecia appressed, moderate or somewhat large, crowded, concave, pale-sordid-rose or clear-horn-coloured, the margin thick, persistent, yellowish-horn-coloured, slightly pulverulent; hypothecium colourless; paraphyses very slender; spores oblong-fusiform, 3-septate, 16-18 μ long, 5 μ thick; hymenial gelatine not tinged, the asci tawny-wine-red, with iodine.—*Lecidea hyalinescens* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 355 (1856); Leight. Lich. Fl. ed. 3, 356.

Exsicc. Larb. Lich. Hb. n. 107.

Resembles a *Gyalecta* in the paler prominent margin of the apothecia.

Hab. On rocks.—*B. M.* Overspreading mossy stone on bank of torrent, Twelve Pins, Connemara, Galway.

15. *B. cuprea* Massal. in Lotos 77 (1856).—Thallus effuse, greenish, whitish or copper-coloured, finely granular, becoming areolate. Apothecia minute, dark or light-brownish, often with a dark margin, becoming flattened, chestnut-brown or reddish-yellow and immarginate; hypothecium colourless; paraphyses subdiscrete, colourless; spores linear- or fusiform-ellipsoid, 1-3-septate, 15-30 μ long, 2-4 μ thick; hymenial gelatine blue with iodine.—*Lecidea cupreosella* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 122 (1857); Cromb. Lich. Brit. 68; Leight. Lich. Fl. 335; ed. 3, 358. *L. luteosella* Nyl. ex Leight. Lich. Fl. ed. 3, 340 (1879).

Distinguished by the minute usually punctiform and rather dark-coloured apothecia. The spores vary considerably in size and form and in all of our specimens of this and the allied species the paraphyses are more or less clavate or swollen at the tips. Stizenberger notes (Nov. Act. Acad. Leop.-Carol. xxxiv. Abh. 2, 9 (1867)) that the thallus varies with the locality and in shady situations is greyish-green or orange.

Hab. On rocks.—*Distr.* Rare in N. England and W. Ireland.—*B. M.* Bilsdale, Yorkshire; Twelve Pins, Connemara, Galway.

16. *B. albidocarnea* A. L. Sm.—Thallus effuse, thin, unequal, rimulose-diffract, whitish or glaucous-white (K —, CaCl —). Apothecia moderate, superficial, plane or somewhat convex, immarginate, pale-flesh-coloured, white within; paraphyses subdiscrete, clavate at the apices; epithecium and hypothecium colourless; spores fusiform-ellipsoid or fusiform-oblong, 1-3-septate, 10-18 μ long, 3.5-4.5 μ thick; hymenial gelatine slightly bluish then wine-reddish with iodine.—*Lecidea albidocarnea* Nyl. in Flora lx. 459 (1877); Cromb. in Grevillea vi. 111; Leight. Lich. Fl. ed. 3, 346.

Similar to the preceding but differs in the larger apothecia, which are pale-coloured from the beginning, and in the usually stouter spores.

Hab. On mica-schist rocks.—*B. M.* Ballynahinch, Galway (the only locality).

Var. *albovirella* A. L. Sm.—Thallus effuse, thin, subleprose, continuous, bright-green, at times nearly evanescent, otherwise as in the species. *Lecidea albovirella* Nyl. in Flora lx. 567 (1877); Cromb. in Grevillea vi. 112; Leight. Lich. Fl. ed. 3, 356.

Exsicc. Larb. Lich. Hb. without number.

Hab. On a shady schistose rock of a ravine in a mountainous district.—*B. M.* Above Lough Feagh, Connemara, Galway (the only locality).

Var. *alborubella* A. L. Sm.—Thallus effuse, very thin, or evanescent, whitish or greenish-white (K —, CaCl —). Apothecia small, convex, immarginate, yellow- or reddish-flesh-coloured; epithecium and hypothecium colourless; paraphyses slender, clavate at the apices; spores linear- or fusiform-oblong, 3-septate, thinner than in the species, 14–21 μ long, 2 μ thick; hymenial gelatine tawny-wine-reddish with iodine.—*Lecidea alborubella* Nyl. in Flora lxii. 205 (1879); Cromb. in Grevillea viii. 28.

Nylander observes that while the thalline gonidia are normal, there are sometimes present hymenial gonidia consisting of cylindrical erect gonidia, not verifiable in our specimens. In the two specimens seen, which are very sparingly fertile, the thallus is little visible, being for the most part overrun by a *Lepraria*.

Hab. On calcareous rocks in a cave in a maritime locality.—*B. M.* Derryclare, Connemara, Galway (the only locality).

Subsp. *chlorotropoides* A. L. Sm.—Thallus effuse, very thin, subleprose, greenish (K —, CaCl —). Apothecia minute, margined, reddish-yellow, the margin usually darker; perithecium violet in thin section; hypothecium often pale-violet; paraphyses subdiscrete, clavate at the apices; spores fusiform-oblong, 1–3-septate, 14–20 μ long, 2–3 μ thick; hymenial gelatine bluish, the asci wine-red with iodine.—*Lecidea chlorotropoides* Nyl. in Flora lx. 567 (1877); Cromb. in Grevillea vi. 112; Leight. Lich. Fl. ed. 3, 346.

Subsimilar to the species, but differs in the colour of the apothecia and in that of the excipulum and hypothecium. In our specimen collected by Larbalestier the few apothecia are ochraceous or somewhat reddish-yellow and immarginate. The spores are narrow and become 3-septate when mature. One of the two specimens from Kylemore is associated with minute patches of a bright purple alga, which may explain the sometimes pale-violet colour of the hypothecium.

Hab. On shady calcareous rocks in a maritime district.—*B. M.* Kylemore, Connemara, Galway (the only locality).

17. *B. herbidula* A. L. Sm.—Thallus effuse, thinnish, subleprose, rimulose or rimulose-diffract, opaque, yellowish-green (K + yellowish, CaCl —). Apothecia minute, plane or somewhat convex, pale-reddish, pale within, the margin thin, darker; paraphyses not well discrete; epithecium and hypothecium colourless; spores fusiform, 1–3-septate, 11–18 μ long, 2.5 μ thick; hymenial gelatine bluish with iodine.—*Lecidea herbidula* Nyl. in Flora lx. 563 (1877); Cromb. in Grevillea vi. 112; Leight. Lich. Fl. ed. 3, 357.

A doubtful species perhaps referable to *B. cuprea*. Nylander has described the thallus as having the characters of *Gongrosira* Kuetz. with subchroolepoid filaments containing numerous large rotundate greenish granules. Our specimen evidently consists of, or is overrun by a dense layer of cells of some alga; I have been unable to find any apothecia.

Hab. On a schistose rock in a maritime district.—*B. M.* Kylemore, Connemara, Galway (the only locality).

18. *B. byssoboliza* A. L. Sm.—Thallus indeterminate, very thin, continuous, opaque, greenish or greyish-green. Apothecia small, somewhat prominent, yellow-flesh-coloured, the margin paler, at length undulate or scarcely distinct, with a white, pubescent base; hypothecium colourless; paraphyses slender, discrete, colourless; spores fusiform, 3-5-septate, 23-27 μ long, 3-4 μ thick; hymenial gelatine pale-bluish then tawny-wine-coloured with iodine.—*Lecidea byssoboliza* Nyl. in Flora lxii. 206 (1879); Cromb. in Grevillea xxii. 58.

Exsicc. Larb. Lich. Hb. n. 267.

Readily recognized by the pubescence at the base of the apothecia. The specimen seen is only sparingly fertile.

Hab. In damp recesses of rocks and walls in a maritime district.—*B. M.* Killerry Bay, Connemara, Galway (the only locality).

19. *B. hemipolioides* A. L. Sm.—Thallus effuse, thin or very thin, rugulose, subopaque, greyish-green. Apothecia small, sessile, convex, immarginate, leaden-coloured or partly pale, epithecium and hypothecium colourless; paraphyses slender, not well discrete, much branched; spores fusiform-oblong, usually somewhat curved, 3-septate, 12-18 μ long, 4.5 μ thick; hymenial gelatine bluish then, especially the asci, tawny-wine-red with iodine.—*Lecidea hemipolioides* Nyl. in Flora lvi. 294 (1873); Cromb. in Journ. Bot. xii. 148 (1874); Leight. Lich. Fl. ed. 3, 356.

Exsicc. Larb. Lich. Hb. n. 347.

Hab. On rocks.—*B. M.* Rozel, Jersey (the only locality).

20. *B. lubens* A. L. Sm.—Thallus effuse, thinnish, granulose, greyish-glaucous. Apothecia small, subplane, then convex and immarginate, pale-flesh-coloured or dull-brown; hypothecium brownish; paraphyses coherent, colourless; spores very variable, 5-9-septate, 28-50 μ long, 7-11 μ thick; hymenial gelatine deep-blue with iodine.—*Lecidea sabuletorum* subsp. *lubens* Nyl. in Flora lvii. 311 (1874). *L. lubens* Cromb. in Grevillea iii. 23 (1874); Leight. Lich. Fl. ed. 3, 366.

Distinguished from *L. sabuletorum* by the lighter-coloured apothecia and by the larger spores.

Hab. On trunks of trees.—*B. M.* Shere, Surrey.

(b) Apothecia dark-coloured, or becoming dark.

21. *B. Nitschkeana* Lahm in Rabenh. Exs. no. 583 (1861).—Thallus effuse, thin, leprose or granulose, greyish-green or greenish-yellow (K —, CaCl —), often nearly evanescent. Apothecia

minute, sessile or adnate, convex, immarginate, pale-dull-yellow brown or blackish; hypothecium colourless; paraphyses scanty, flexuose, and branched, subdiscrete, the epithecium dark (K + violet); spores oblong or fusiform-ellipsoid, 3-septate, 12–20 μ long, 3–4 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea Nitschkeana* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxiv. Abh. 2, 70 (1867); Cromb. in Grevillea xxii. 58. *L. spododes* Nyl. in Flora lii. 410 (1869); Cromb. in Journ. Bot. vii. 233 (1869) & Lich. Brit. 70; Leight. Lich. Fl. 261; ed. 3, 257.

Nylander described *Lecidea spododes* originally from Lyndhurst, as having spores up to 14 μ long; he (or Crombie) afterwards included it under *L. Nitschkeana* Stiz. as diagnosed above. Bouly de Lesdain (Suppl. Lich. H. Dunk. 1914, 119) has revived *L. spododes* as a distinct species of *Bilimbia* with the smaller type of spores and with the epithecium giving a violet reaction with potash. Our specimens from Lyndhurst give the same reaction along with the larger spores (up to 20 μ long). The difference between the two is hardly specific.

Hab. On old palings.—*Distr.* Rare in the South of England and in Wales.—*B. M.* Lyndhurst, New Forest, Hants.

22. *B. sabuletorum* Branth & Rostr. in Bot. Tidsskr. iii. 229 (1869), (excl. vars. b & c).—Thallus effuse, thin or very thin, granulose or leprose, sordid-greyish, or whitish (K —, CaCl —). Apothecia rather small, sessile, at first subplane and thinly margined, then convex and immarginate, pale-brown or brownish-black, pale within; hypothecium colourless, brownish; paraphyses concrete, brownish at the apices; spores fusiform, 3–7-septate, 18–34 μ long, 6–8 μ thick; hymenial gelatine deep-blue then dark-violet or tawny-wine-red with iodine.—*B. sphaeroides* Mudd Man. 187 (1861) (non Koerb.). *Lichen viridescens* Sm. Engl. Bot. t. 2217 (1810) (non Schrad.). *Lecidea sabuletorum* Floerke in Berl. Mag. 1808, 309 pro parte; Nyl. in Journ. Linn. Soc. ix. 254 (1867); Cromb. Lich. Brit. 71 (excl. vars.) & in Grevillea xxii. 57; Leight. Lich. Fl. 338; ed. 3, 364. *L. hypnophila* Turn. ex Ach. Lich. Univ. 199 (1810). *L. viridescens* Hook. in Sm. Engl. Fl. v. 180 (1833) (non Ach.). *L. subretusa* Stirton in Grevillea iii. 24 (1874) (*fide* Cromb. in Grevillea iii. 143); Leight. Lich. Fl. ed. 3, 366.

Exsicc. Leight. n. 91 (as *Biatora muscorum*; Mudd n. 154; Cromb. n. 175; Larb. Lich. Hb. nos. 35, 36, 37; Larb. Cæsar. n. 81 and Lich. Cantab. n. 31; Johns. n. 339.

The thallus is sometimes greener and thicker, a condition published by T. Watson as *f. viridis* in Journ. Bot. lv. 210, 1917. It was collected by W. Hebden at Harden Moor, Yorkshire.

Hab. Incrusting mosses on rocks, old walls, and decayed trunks of trees in maritime but chiefly upland tracts.—*Distr.* Widely distributed in Great Britain, and usually plentiful where it occurs; apparently rare in W. Ireland.—*B. M.* Jersey; Cobo and St. Martin's, Guernsey;

Shanklin Downs, I. of Wight; Wadebridge, Newlyn Cliff, St. Mervyn and St. Breock, Cornwall; Dittisham Cross, near Dartmouth and Totnes, Devon; Bathampton Downs, Somerset; Amberley and near Cirencester, Gloucestershire; Preston, Shoreham and Henfield Common, Sussex; Broomfield, Essex; near Oxford; Burwell and Newmarket, Cambridgeshire; Norton, near Worcester; Ludlow, Farlow, Oswestry and Condover Park, Shropshire; Tenby, Pembrokeshire; Bridge End, Glamorganshire; Nannau and Dolgelly, Merioneth; Chirk, Denbigh; Matlock and near Buxton, Derbyshire; Kildale, Cleveland, Yorkshire; Teesdale, Durham; Heversham Head, Westmorland; Alston, Cumberland; Canlochan Glen, Forfarshire; Killin, Craig Tulloch, Blair Athole and Ben Lawers, Perthshire; Achosragan, Appin, and Connel Ferry, Argyll; Craig Cluny, Braemar and Cults, Aberdeenshire; Glen Nevis, Inverness-shire; Dinish, Killarney, Kerry; Ballinakill, Connemara, Galway.

Var. simplicior A. L. Sm.—Externally similar to the species, but the thallus usually rather more developed and subsquamulose. Apothecia internally brownish-yellow; spores very variable in form and size, oblong, or somewhat clavate, acute at one end, usually 1-septate, sometimes 2- or 3-septate, 11–18 μ long, 4–5 μ thick.—*Lecidea sabuletorum* f. *simplicior* Nyl. Lich. Scand. 205 (1861); var. *Dufourei* Cromb. Lich. Brit. 71 (1870); Leight. Lich. Fl. 338; ed. 3, 364; var. *monophragmia* Nyl. ex Cromb. l. c.; Leight. l. c. *L. Dufourei* Ach. ex Nyl. in Flora l. 373 (1867).

Differs in the form of the spores. Th. Fries (Lich. Scand. 340, 1874) classifies this variety as *Toninia squalescens*.

Hab. Incrusting mosses on rocks. **Distr.** Rare in high altitudes.—*B. M.* Cader Idris, Merioneth; Ben Lawers, Perthshire.

Var. obscurata A. L. Sm. Thallus effuse, thin, granulose, greyish-white or greyish. Apothecia moderate in size, sessile, concave and thickly margined, at length convex and immarginate, brown, reddish-brown, or blackish, pale within; paraphyses loosely coherent; epithecium and hypothecium yellowish-brown; spores ellipsoid or subfusiform, 3-septate, 15–30 μ long, 5–8 μ thick; hymenial gelatine bluish then dark-violet or wine-red with iodine.—*Lecidea sphaeroides* var. *obscurata* Sommerf. Fl. Lapp. Suppl. 165 (1826). *L. sabuletorum* f. *triplicans* Nyl. Lich. Scand. 205 (1861). *L. triplicans* Nyl. Lich. Fret. Behring. 24 (1888); Cromb. in Grevillea xxii. 57.

The apothecia are larger and darker than those of the species; they are very plentiful in our single specimen.

Hab. On mosses on rocks and on trees.—*B. M.* On mossy boulders, Morrone, Braemar, Aberdeenshire.

Var. septenaria A. L. Sm.—Thallus effuse, greyish-green. Apothecia convex, brownish or pale-lead-coloured; hypothecium brownish; paraphyses colourless, rather stout, subconcrete,

somewhat clavate at the tips; spores fusiform, 5–7-septate, 17–34 μ long, 6–7 μ thick.—*Lecidea metamorphea* var. *septenaria* Nyl. in Flora lix. 239 (1876); Leight. Lich. Fl. ed. 3, 356.

Distinguished from *B. metamorphea* by the presence of paraphyses. In habit and general appearance it resembles *B. sabuletorum*, differing only in the somewhat peculiar paraphyses.

Hab. On decaying mosses in fissures of rocks.—*B. M.* Near Kylemore, Connemara, Galway (the only locality).

23. *B. subviridescens* A. L. Sm.—Thallus effuse, very thin, greenish or sordid-greenish, opaque, often obsolete. Apothecia small, convex, immarginate, brown or livid-brown, opaque, dark within; paraphyses coherent; epithecium and hypothecium pale or brownish; spores oblong, simple or 1–3-septate, 11–18 μ long, 4–6 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea subviridescens* Nyl. in Flora li. 474 (1868); Leight. in Ann. Mag. Nat. Hist. ser. 4, iii. 267 (1869) & Lich. Fl. 324; ed. 3, 344; Cromb. Lich. Brit. 71.

Characterized by the darker, thinner thallus, the darker apothecia and the smaller spores.

Hab. Incrusting mosses or on the ground.—*Distr.* Somewhat rare in the Channel Islands and S. England.—*B. M.* Boulay Bay, Jersey; Ventnor, I. of Wight.

Var. *trisepta* A. L. Sm.—Thallus subdeterminate or effuse, very thin, subgranulose, dark-greyish or blackish, at times nearly obsolete. Apothecia minute, irregularly congregate, black; hypothecium colourless; spores obtusely fusiform, 3-septate, 14–22 μ long, 4–5 μ thick; hymenial gelatine bluish then, especially the asci, violet or wine-reddish with iodine.—*Biatora trisepta* Næg. ex Muell. in Mém. Soc. Phys. Hist. Nat. Genev. xvi. 404 (1862) *fide* Th. Fr. Lich. Scand. 382 (1874). *Lecidea ternaria* Nyl. in Flora lx. 232 (1877); Leight. Lich. Fl. ed. 3, 358; Cromb. in Grevillea xxii. 58 (excl. var. *saxigena*, a form of *B. lignaria*) *Lecidea sabuletorum* var. *milliaria* f. *ternaria* Nyl. in Not. Sällsk. Fäun. & Fl. Fenn. n. ser. v. 151 (1866).

Exsicc. Mudd. n. 157 (as *B. milliaria* var. *saxatilis*); Larb. Lich. Hb. without number.

Differs from the type in the darker thallus, and the somewhat smaller constantly 3-septate spores.

Hab. On moss and stones.—*Distr.* Rare throughout the British Isles.—*B. M.* Baysdale Moor and Lounsedale, Cleveland, Yorkshire; I. of Lismore, Argyll; Doughruagh Mt., and near Kylemore, Connemara, Galway.

24. *B. lignaria* Massal. Ric. Lich. 121 (1852) pro parte.—Thallus effuse, granulose or subpulverulent, thinnish, greyish-green or whitish or almost obsolete (K + yellowish, CaCl +

reddish). Apothecia small, sessile or adnate, convex, hemispherical, immarginate, somewhat shining or opaque, blackish; paraphyses concrete, dark-greenish-blue or dark-olivaceous at the apices; hypothecium pale- or sordid-brown: spores oblong or narrowly oblong-fusiform, straight or slightly curved, 3-7-septate, 16-32 μ long, 5-7 μ thick: hymenial gelatine bluish, the asci at length dark, with iodine.—*B. milliaria* Koerb. Syst. Lich. Germ. 214 (1855); Mudd Man. 188. *Lecidea lignaria* Ach. in Vet. Acad. Handl. 1808, 236 & Lich. Univ. 169. *L. milliaria* Fr. in Vet. Acad. Handl. 1822, 255; Leight. Lich. Fl. 338 pro parte (incl. f. *lignaria* & f. *saxigena*); ed. 3, 362 pro parte; Cromb. in Grevillea xxii. 58. *L. geomaa* Tayl. in Mackay Fl. Hib. ii. 124 (1836). *L. uliginosa* var. *geomaa* Ach. Meth. 43 (1803)? *L. sabuletorum* var. *milliaria* Cromb. Lich. Brit. 71 (1870).

Exsicc. Mudd nos. 156, 158; Leight. nos. 210, 238, 386, 388; Larb. Lich. Hb. 272; Bohl. n. 85 (as *Lecidea viridescens*); Johns. nos. 375 (as *Lecidea Turneri*), 453.

Externally well characterized by the very numerous small often crowded or confluent apothecia, and also by their internal structure. The thallus varies somewhat in colour and form according to the habitat. *Lecidea saxigena* Uloth ex Leight. Lich. Fl. ed. 3, 363 is incompletely described, but is evidently a saxicolous condition of this species. It is recorded from Wales and N.W. Ireland.

Hab. On the ground, usually incrusting mosses, rarely on old palings, rocks, and stones from maritime to alpine situations.—*Distr.* Somewhat local in Great Britain and Ireland, but usually plentiful where it occurs; very rare and only saxicolous in the Channel Islands.—*B. M.* Rozel, Jersey; Epping Forest, Essex; Toy Hill, Kent; Leith Hill, Surrey; Fairlight Glen, Hastings. Lavington and Chillington Common, Sussex; near Lyndhurst, New Forest, Hants; Dartmoor, Devon; near Penzance, Cornwall; Buxton, Derbyshire; Neescliff Hill, Shropshire; Llanwyrtyd, Breconshire; Llyn Howel, Dolgelly and Cader Idris, Merioneth; Glyder Fawr, Carnarvonshire; Glandwr, Carmarthenshire; Baysdale and Guisboro' Moor, Cleveland, Yorkshire; Ennerdale and St. Bees, Cumberland; Ben Cruachan, Argyll; Crianlarich, Craig Calliach and Ben Lawers, Perthshire; Banchory Devenick, near Aberdeen, Craig Guie, Braemar, Aberdeenshire; near Belfast, Antrim; Doneraile Mts., Cork; Dunkerron and Killarney, Kerry; near Kylemore, Galway; Clare Island and Achill Island, Mayo.

Form *nigrata* A. L. Sm. — Thallus dark, scarcely visible; hypothallus blackish, predominating. Apothecia black; spores fusiform, 30-40 μ long, 7 μ thick.—*Lecidea sabuletorum* var. *milliaria* f. *nigrata* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. 151 (1866).

Perhaps merely an alpine condition, with nearly obliterated thallus (very sparingly present in the British specimen) and slightly different spores.

Hab. Incrusting mosses on rocks in an alpine situation.—*B. M.* Summit of Ben Lawers, Perthshire.

25. **B. melæna** Arnold in Flora xlviii. 596 (1865).—Thallus effuse, very thin, leprose-granulose, or sometimes gelatinous, sordid-greenish, greyish or brownish-black (K —, CaCl —), often evanescent. Apothecia small, convex, immarginate, black; hypothecium brownish-red or purplish-black; paraphyses concrete, violet- or bluish-black at the apices, the colour often penetrating downwards; spores linear-oblong, 3-septate, 14–22 μ long, 4–6 μ thick; hymenial gelatine bluish then dark-violet with iodine.—*B. milliaria* var. *melæna* Mudd Man. 188 (1861). *B. ilyophora* Wheld. & Wils. in Journ. Bot. liii. Suppl. 63 (1915). *Lecidea malæna* Nyl. in Bot. Not. 1853, 182; Carroll in Journ. Bot. v. 256 (1867); Cromb. Lich. Brit. 71; Leight. Lich. Fl. 329; ed. 3, 353. *L. ilyophora* Stirt. in Scott. Nat. v. 220 (1880).

Exsicc. Mudd n. 169; Johns. n. 376.

Readily distinguished by the very dark thallus and apothecia.

Hab. On turfy ground, occasionally on dead wood, in upland districts.—*Distr.* Apparently very local in England, Wales and Ireland; common on the Grampians, Scotland; not seen from the Channel Islands.—*B. M.* Near Lyndhurst, New Forest, Hants; above Aber-gwesyn, Breconshire; Cader Idris, Merioneth; Ingleby Moor, Cleveland, Yorkshire; Eskdale, Cumberland; Achosragan Hill, Appin, Argyll; Ben Lawers, Rannoch, and at base of Ben-y-Gloe, Perthshire; Glen Dee, Braemar, Aberdeenshire; Howth, Dublin; Croghan, Killarney, Kerry.

26. **B. leucoblephara** Arnold in Flora lxvii. 574 (1884).—Thallus determinate or subeffuse, thin, opaque, greyish- or greyish-green (K + yellow, CaCl —). Apothecia small, plane, margined, brownish-black or black, blackish within, the margin white; hypothecium brownish-black; paraphyses concrete; spores fusiform-oblong, 3-septate, colourless, 10–19 μ long, 4–6 μ thick; hymenial gelatine bluish then violet-coloured with iodine.—*Lecidea leucoblephara* Nyl. in Ann. Sci. Nat. sér. 4, xix. 338 (1863); Leight. Lich. Fl. ed. 3, 351; Cromb. in Grevillea xxii. 57.

Exsicc. Larb. Lich. Hb. without number.

Easily recognized by the white pubescence encircling the apothecia.

Hab. On rocks (found on the Continent on furze, heather, etc.).—*B. M.* Near Kylemore, Connemara, Galway.

27. **B. rhexoblephara** A. L. Sm.—Thallus effuse, thin, greyish or dirty-white (K —, CaCl —), often little visible. Apothecia rather small, black, urceolate, then plane, with a thickish prominent deeply-crenate margin; hypothecium thick, black, dark-brown in thin section; hymenium whitish; paraphyses brown, somewhat thick and septate at the apices; spores oblong- or fusiform-ellipsoid, 3-septate, 17–21 μ long, 6–7 μ thick; hymenial gelatine bluish with iodine.—*Lecidea rhexoblephara* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 337 (1857) & in Ofvers. K. Vet. Akad.

Förh. 1860, 297; Carroll in Journ. Bot. iii. 290 (1865); Cromb. Lich. Brit. 89; Leight. Lich. Fl. 333; ed. 3, 355.

Distinguished by the peculiar crenate or coronate margin of the apothecia on account of which it was separated by Th. Fries as a new genus, *Rhexophiale* (Lich. Arct. 205 (1860)). Our specimens are sparingly fertile; the apothecia are somewhat scattered or occasionally approximate.

Hab. On decaying mosses among schistose rocks in alpine localities. —B. M. Summit of Ben Lawers, Perthshire; Craig Ellachie, Aviemore, Inverness-shire; Ben Thurain, Assynt, Sutherland.

28. *B. premneoides* A. L. Sm.—Thallus effuse, thinly leprose, pale- or greyish-greenish (K —, CaCl —). Apothecia moderate, plane, margined, black; paraphyses slender; epithecium at times slightly greenish-suffused; hypothecium black; spores oblong, obsoletely or thinly 3-septate, 19–25 μ long, 7–8 μ thick; hymenial gelatine wine-red with iodine.—*Lecidea premneoides* Nyl. in Flora xlviii. 147 (1865); Leight. in Ann. Mag. Nat. Hist. ser. 3, xvii. 62 (1866) & Lich. Fl. 333; ed. 3, 350; Cromb. Lich. Brit. 79. Specimen not seen.

Hab. On walls.—*Distr.* Very rare, collected by Larbalestier in the Channel Islands (Jersey) and in W. Ireland.

29. *B. violacea* Th. Fr. Lich. Scand. 372 (1874).—Thallus very thin, subgranulose, greyish-white (K —, CaCl —), often sub-avanescent. Apothecia small, adnate, nearly plane or subconvex, immarginate, pale-leaden-coloured; hypothecium colourless; paraphyses slender, concrete; spores oblong, 3-septate, often slightly curved, 14–17 μ long, 5–7 μ thick; hymenial gelatine bluish, the asci at length faintly wine-red, with iodine. —*Lecidea violacea* Crouan ex Nyl. in Flora xlv. 464 (1862); Carroll in Journ. Bot. iii. 290 (1865); Cromb. Lich. Brit. 71; Leight. Lich. Fl. 335; ed. 3, 355. Specimen not seen.

Evidently a very rare plant, resembling externally a biatorine form of *Lecanora syringea*. Spore sizes are taken from Stizenb. in Nov. Act. Acad. Leop.-Carol. xxxiv. 2. 66 (1868). Fries while agreeing in other particulars gives the measurements at 12–18 $\mu \times 3\text{--}5 \mu$.

Hab. On rocks in a maritime district. *Distr.* Very local and sparingly in N. Scotland (Lerwick, Shetland Islands).

30. *B. trachona* Arnold in Flora lxvii. 575 (1884).—Thallus effuse, thin, subleprose, minutely granulose or nearly evanescent, whitish, greyish-white or greenish (K —, CaCl —). Apothecia minute, plane, opaque, thinly margined, dark-brown, at length convex and immarginate; hypothecium brownish or somewhat pale; paraphyses scanty, slightly incrassate at the apices, not well discrete; epithecium nearly colourless or slightly brownish-black; spores fusiform-oblong or fusiform, 1–3-septate, 11–19 μ long, 30–35 μ thick; hymenial gelatine bluish then sordid-violet

or wine-red with iodine.—*Verrucaria trachona* Ach. Meth. Suppl. 16 (1803); Borr. in Engl. Bot. Suppl. 2647. f. 1. *Lecidea trachona* Nyl. in Flora xlvii. 620 (1864); Cromb. Lich. Brit. 71; Leight. Lich. Fl. 329; ed. 3, 351.

Exsicc. Larb. Cæsar. n. 80.

In our specimens the thallus is sordid-greenish: Borrer notes its resemblance to a *Lepraria*. Apothecia and spermogones are frequent; when the latter only are present the plant resembles superficially a *Verrucaria*. Wainio (Lich. Fenn. ii. 232, 1922) states that *B. trachona* grows in shady places or in caves.

Hab. On rocks in maritime localities.—*Distr.* Rare in the Channel Islands, S.W. England, and S.W. Ireland.—*B. M.* The Warren, Noirmont, Jersey; Dixcart Bay, Sark; near Penzance, Cornwall; Turk Mt., Killarney, Kerry.

31. *B. chlorococca* Græwe ex Th. Fries Lich. Scand. 380 (1874).—Thallus thin, furfuraceous or granulose, dull-yellowish-green. Apothecia reddish-brown or black, minute, adnate, convex, immarginate; hypothecium colourless; paraphyses gelatinous, distinct, dull-olive-green or pale at the tips; spores fusiform, straight or curved, 3-7-septate, 22-38 μ long. 3-5 μ thick; hymenial gelatine blue then dull-wine-red with iodine.—*Biatora hypnophila* var. *chlorococca* Græwe in Öfvers. K. Vet. Akad. Förh. 1862, 473. *Lecidea chlorococca* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxiv. 2, 24 (1868).

Var. *hilarior* Th. Fr. & Hult. Lich. Scand. 380 (1874).—Apothecia reddish or reddish-brown; paraphyses pale at the tips otherwise as in the species, which has not been found in Britain.

Exsicc. Larb. Lich. Hb. n. 351.

Hab. On trees.—*B. M.* Mickleham, Surrey; Charnwood Forest, Leicestershire; Tinnahinch, Carlow.

32. *B. subturgidula* A. L. Sm.—Thallus effuse, very thin, greenish-white or obsolete. Apothecia small, scattered, convex, immarginate, dark-brown or pale-leaden-coloured; hypothecium brown, whitish in upper layer; paraphyses concrete; epithecium white or yellowish-white; spores oblong, 8-14 μ long, 3-4 μ thick; hymenial gelatine bluish then often tawny-yellow with iodine.—*Lecidea subturgidula* Nyl. in Flora li. 343 (1868); Cromb. in Journ. Bot. vii. 48 (1869) & Lich. Brit. 72; Leight. Lich. Fl. 324; ed. 3, 344.

According to Nylander allied to *L. apochroella*, a Finland species, but differs in the larger spores and the colour of the hypothecium.

Hab. On old stumps of holly.—*B. M.* Near Lyndhurst, New Forest, Hants.

33. *B. deducta* A. L. Sm.—Thallus effuse, very thin, leprose, dispersed, greenish (K —, CaCl —), scarcely visible. Apothecia subminute, blackish, somewhat plane, and thinly margined, then

convex and immarginate, reddish in thin section, hypothecium darker in the middle; paraphyses indistinct; spores ellipsoid or oblong, 3-septate, colourless, brownish in the mass, 10–13 μ long, 3.5–4.5 μ thick; hymenial gelatine bluish then wine-reddish with iodine.—*Lecidea deducta* Nyl. in Flora lii. 410 (1869); Cromb. in Journ. Bot. vii. 233 (1869) & Lich. Brit. 72; Leight. Lich. Fl. 328; ed. 3, 349.

Distinguished from the preceding chiefly by the darker apothecia and by internal characters. The proper thallus, often obscured by a foreign gelatinous thallus, is sparingly present in the specimens gathered.

Hab. On old stumps of holly.—*B. M.* Near Brockenhurst, New Forest, Hants.

77. **BACIDIA** De Not. in Giorn. Bot. Ital. Ann. 2. I. i. 189 (1846) emend.; Th. Fries Lich. Aret. 179 (1860). *Scoliciosporum* Massal. Ric. Lich. 104 (1852); Mudd Man. 185. *Raphiospora* Massal. Alc. Gen. Lich. 11 (1853); Mudd Man. 186. (Pl. 11.)

Thallus effuse, minutely squamulose or crustaceous. Algal cells Protococcaceæ. Apothecia brightly coloured or dark, sometimes carbonaceous (*Raphiospora*), immarginate or with proper margin only; asci usually 8-spored; spores elongate, colourless, pluriseptate, straight, sometimes spirally-curved (*Scoliciosporum*).

The genus *Bacidia*, as here understood, includes not only those forms of Lecideaceæ with acicular straight spores, but also *Scoliciosporum* in which the spores are spirally curved, and *Raphiospora* which has been considered by some authors distinct on account of the carbonaceous outer wall of the apothecium. The colour of the apothecia is variable, but refers generally to the earlier growth stages.

Thallus more or less squamulose.

1. **B. pulvinata** Mudd Man. 185 (1861).—Thallus indeterminate, thickish, pulvinate, granulose-squamulose, the squamules minute, congregate in subconvex tufts, pale-greenish-brown or cream-coloured (K + yellow, CaCl —); hypothallus thickish, black. Apothecia small, at first concave then plane, with thick obtuse margin, at length convex and immarginate, black; hypothecium thick, dark-reddish-brown (K + blackish); paraphyses slender, conglutinate; epithecium deep-yellow; spores acicular or slightly clavate, straight or somewhat curved, 3–7-septate, 20–38 μ long, 3–5 μ thick; hymenial gelatine, especially the asci, bluish then wine-red with iodine.—*Lecidea pulvinata* Tayl. in Mackay Fl. Hib. ii. 123 (1836); Cromb. Lich. Brit. 75; Leight. Lich. Fl. 345; ed. 3, 372.

Characterized by the peculiar thallus which grows in small scattered tumid roundish or difform pulvinate masses. The apothecia are not numerous in the specimens seen.

Hab. Overspreading decayed mosses on turfy soil in mountainous districts.—*Distr.* Rare in Wales, S.W. and N.W. Ireland.—*B. M.*

Barmouth, Merioneth; Glyder, Carnarvonshire; near Dunkerron and Mangerton, Kerry; Barnageeha and Doughruagh Mt., Galway.

Form **thiopsora** A. L. Sm.—Thallus white-sulphureous. Apothecia often 2–4-connate, subconvex, naked or greyish-yellow-suffused (K + yellow); otherwise as in the species.—*Lecidea thiopsora* Nyl. in Flora lix. 573 (1876); Cromb. in Grevillea v. 106; Leight. Lich. Fl. ed. 3, 354. *L. pulvinata* f. *thiopsora* Nyl. in Flora lxii. 223 (1879); Cromb. in Grevillea viii. 30. *Exsicc.* Larb. Lich. Hb. n. 185.

Hab. On mossy ground among rocks in a mountainous region.—*B. M.* Doughruagh Mt., Connemara, Galway (the only locality).

2. **B. polysita** A. L. Sm.—Thallus dark-grey or pale-greyish-brown, thickish, squamulose, the squamules crenulate or sometimes slightly concave (K —, CaCl —). Apothecia brown or brownish-black, sessile, somewhat plane, immarginate, at length convex and prominent; hypothecium thick, reddish-yellow, brown or blackish-brown in a thick section; paraphyses distinct, colourless at the apices and not clavate; spores acicular or slenderly clavate, straight, 3–11-septate; hypothecium and lower portion of the hymenium K + purple.—*Lecidea polysita* Stirton in Scott. Nat. iv. 28 (1877); Leight. Lich. Fl. ed. 3, 368.

Hab. On old dead bark.—*Dist.* Rare in W. Scotland.—*B. M.* Ben Brecht, Argyll.

Thallus crustaceous.

(a) Apothecia light-coloured at first.

3. **B. rosella** De Not. in Giorn. Bot. Ital. Ann. 2, I. i. 189 (1846).—Thallus effuse, thin, unequal or subgranulose, greyish-green or greyish-white. Apothecia moderate, sessile, concave, then plane with thick obtuse paler margin, at length convex, immarginate, rose- or flesh-coloured, slightly pruinose; hypothecium colourless; paraphyses slender, loosely coherent; epithecium granulose, yellowish; spores acicular, colourless, 68–98 μ long, 4.5–5 μ thick; hymenial gelatine deep blue then sordid-violet with iodine.—Mudd Man. 181. *Lichen rosellus* Pers. in Ust. Ann. Bot. vii. 25 (1794) (non Engl. Bot. t. 1651, vide Cromb. Part i. 419). *Lecidea rosella* Ach. Meth. 57 (1803); S. F. Gray Nat. Arr. i. 474; Cromb. Lich. Brit. 73; Leight. Lich. Fl. 341; ed. 3, 369 (excl. syn. Engl. Bot.). *L. alabastrina* Ach. Lich. Univ. 190 (1810); Hook. Fl. Scot. ii. 40 & in Sm. Eng. Fl. v. 184; S. F. Gray l.c.

Easily recognized by the colour of the apothecia, which, however, at times become rather darker in age; though numerous they are somewhat scattered, especially when the thallus is less crowdedly granulose. In other respects it is intimately related to the following species.

Hab. On the trunks of trees in maritime and upland districts.—*Distr.* Very local and scarce in S. and N. England (Ripon, Yorkshire, *vide* Mudd) and S.W. Ireland.—*B. M.* Chelsfield, Kent; near Hastings,

Sussex; near Ringwood, Hants; Oldbury and near Alfrick, Worcestershire; Dunkerron, Kerry.

4. *B. luteola* Mudd Man. 183, t. 3, f. 68 (1861) pro parte.—Thallus effuse, thin, leprose-granulose, greyish or greyish-green (Kf + yellowish, CaCl —), at times nearly obsolete. Apothecia moderate, sessile, naked, at first concave, becoming plane and obtusely margined, at length convex or subglobose, the margin excluded, yellow-reddish or reddish-flesh-coloured; hypothecium pale-yellowish; paraphyses slender, loosely coherent; epithecium not distinct; spores acicular, pluri-septate (the septa at length 16), 45–90 μ long, 3–4.5 μ thick; hymenial gelatine bluish then dark-wine-red or violet with iodine.—*B. rubella* Massal. Ric. Lich. 118 (1852); Mudd Man. 182, t. 3, f. 68 (excl. vars.). *Lichen luteus* Gmelin Syst. Nat. ii. 1359 (1791)? *L. luteolus* Schrad. Spicil. Fl. Germ. 85 (1794). *L. vernalis* With. Arr. ed. 3, iv. 14 (1796) (non L., non Hoffm.); Engl. Bot. t. 845. *Verrucaria rubella* Hoffm. Deutshl. Fl. ii. 174 (1795). *Lecidea luteola* Ach. Meth. 60 (1803) (excl. vars.); S. F. Gray Nat. Arr. i. 472; Tayl. in Mackay Fl. Hib. ii. 126; Cromb. Lich. Brit. 73. *L. vernalis* Ach. Meth. 68 (1803); S. F. Gray *tom. cit.* 470; Hook. in Sm. Eng. Fl. v. 183 pro parte. *L. rubella* Schaer. Spicil. 168 (1836); Leight. Lich. Fl. 341; ed. 3, 369 (excl. syn. *Lichen porriginosus*); Cromb. in Grevillea xxii. 58.

Ersicc. Bohl. n. 91; Leight. n. 92; Cromb. n. 86; Larb. Lich. Hb. n. 184; Johns. n. 374.

Lichen luteus Gmelin is quoted by Acharius (Prod. Lich. Suec. 42 (1798)), as a synonym, but this identification is uncertain. The species-name *vernalis*, based on *Lichen vernalis* Lightf. (Fl. Scot. ii. 805 (1777)) has been adopted by some authors; but Lightfoot's plant is identical, in part, with *Placodium ferrugineum* (Pt. i. 221). *Lichen rubellus* Ehrh. does not rank, being only a *nomen nudum*. The apothecia are usually abundant and scattered, but sometimes there are several aggregate with the margin irregular and sublobate.

Hab. On trunks of trees, chiefly elms, in wooded maritime and upland situations. *Distr.* General and common in most parts of England, rare in Wales, Scotland, Ireland, and the Channel Islands. — *B. M.* Patrimoine, Jersey; Guernsey; Ulting, Broomfield, Gosfield Hall, Quendon and Epping Forest, Essex; Chilstone Park, Kent; Middleton, Lavington Park, Chanetonbury and Glynde, Sussex; Ringwood and Lyndhurst, New Forest, Hants; Ilsham, Torquay, Devon; Kynance, Coverack, near the Lizard, St. Judy and near Penzance, Cornwall; Bathampton Downs, Somerset; near Bourton-on-Water, Cirencester, Clifton and Chesterton, Gloucestershire; Banbury, Oxfordshire; near Cambridge; near Yarmouth, Norfolk; Gopsall, Leicestershire; Broadwas and near North Malvern, Worcestershire; Aberdovey, Merioneth; Oswestry and Shelton Rough, near Shrewsbury, Shropshire; Kildale and Newton Wood, Cleveland, Yorkshire; Teesdale, Durham; Cumberland; Airds, Appin, Argyll; Craiglockart, near Edinburgh; Aberfeldy, Perthshire; Tervoe and Carrigounnell, near Limerick; Shane's Castle, Antrim; Connemara, Galway.

Var. *porriginosa* A. L. Sm.—Thallus as in the type. Apothecia reddish-flesh-coloured, the margin white-suffused, at length convex and immarginate; spores 3–7-septate, 48–62 μ long, 3–3.5 μ thick.—*Lichen porriginosus* Turn. in Trans. Linn. Soc. viii. 94, t. 8, f. 4 (1807). *Lecidea luteola* var. *porriginosa* Cromb. Lich. Brit. 73 (1870). *L. rubella* var. *porriginosa* Cromb. in Grevillea xxii. 58 (1893).

Distinguished by the white marginal pruina, ultimately evanescent, which gives the apothecia much the aspect of those of *B. rosella*.

Hab. On trunks of trees, chiefly elms, in maritime and upland tracts.—*Distr.* Seen from only a few localities in E. and S. England and S. Wales.—*B. M.* Near the Lizard, Cornwall; near Beeding Windmill and Hurstpierpoint, Sussex; Brockenhurst, Hants; Llandrindod, Radnorshire; Yarmouth, Norfolk.

5. *B. acerina* Arn. in Flora xlv. 391 (1862).—Thallus thinnish, coarsely granular, yellowish- or greenish-white. Apothecia prominent, at first concave with a thick rounded margin, becoming plane or sometimes subconvex, flesh-red, then chestnut-brown to blackish; excipulum colourless or rose-coloured; hypothecium colourless; paraphyses slender, coherent, more or less violet-blue or violet-red at the apices according to the colour of the apothecium; spores acute at each end, straight or spirally curved, up to 15-septate, 50–80 μ long, 2.5–3.5 μ thick.—*Lecidea luteola* var. *acerina* Ach. Meth. 60 (1803). *L. acerina* Nyl. in Flora lv. 356 (1872); Cromb. in Grevillea xxii. 58.

Included by Crombie in his list of British Lichens. There is no British specimen in the Museum, and I know of no record.

Hab. On bark chiefly of pine, more rarely of oak. Originally found on *Acer* by Persoon and sent by him to Acharius.

6. *B. phacodes* Koerb. Parerg. Lich. 130 (1860).—Thallus effuse, thin, leprose-granulose, greenish or whitish. Apothecia small, sessile, whitish or pale, becoming darker red or reddish rose, at first almost plane with paler margin, then convex, immarginate; hypothecium colourless; paraphyses concrete, colourless, pale-yellowish at the apices; spores very thinly acicular, faintly 3–15-septate, 27–40 μ long, 2 μ thick; hymenial gelatine bluish then wine-red with iodine.—*B. albescens* Zwackh in Flora xlv. 495 (1862). *Lecidea luteola* var. *chlorotica* Ach. Lich. Univ. 196 (1810). *L. arceutina* f. *chlorotica* Cromb. Lich. Brit. 73 (1870). *L. phacodes* Leight. Lich. Fl. 343 (1871); ed. 3, 363 (incl. f. *chlorotica*). *L. chlorotica* Nyl. ex Norrl. in Medd. Sällsk. Faun. & Fl. Fenn. i. 31 (1876); Cromb. in Grevillea vi. 21; f. *albescens* Hepp ex Leight. Lich. Fl. ed. 3, 546 (1879).

Exsicc. Larb. Lich. Hb. nos. 108, 183, 351 (as *Lecidea Nyländeriana*, *nomen nudum* (1881)), & Lich. Cantab. n. 32; Cromb. n. 173.

Leighton (*l. c.*) records *f. chlorotica* on *Thymus*, *Ulex*, *Calluna*, and *Ulmus*. According to Zahlbruckner, *Pyrenotheca furcella*, which is occasionally present, is the spermogonial form, with spermatia 6.5 μ long, 1.5–2 μ thick.

Hab. On trunks of trees, birch, ash, maple, etc., also on leather, in maritime and upland wooded situations.—*Distr.* Not uncommon in England and S. and W. Ireland, rare in S. Wales and the Channel Islands, not recorded from Scotland.—*B. M.* St. Ann Port, Jersey; Newlyn Cliff, Penzance, Cornwall; Shanklin, I. of Wight; near Bovey Tracey, Devon; New Forest, Hants; Glynde, Sussex; Maidstone, Kent; Ulting and Gosfield Hall, Essex; Wimpole Park and near Newmarket, Cambridgeshire; near Brandon, Suffolk; Deerhurst, Gloucestershire; near Worcester; Charnwood Forest, Leicestershire; Fort Hill, Fishguard, Pembrokeshire; near Yarm, Cleveland, Yorkshire; Leven's Park, Westmorland; Duncombe's Wood, Cork; Tervoe and Castleconnel, Limerick; Dinish, Killarney, Kerry.

7. **B. fuscrobella** Arn. in *Flora* liv. 55 (1871).—Thallus effuse, thin, dark-grey or whitish. Apothecia brown (containing Bacidia-brown), sessile or adnate, large, at first plane and thinly margined, then convex and immarginate: hypothecium brownish-yellow (K + carmine-red); paraphyses slender, loosely coherent, yellowish at the apices: spores straight, rather stout, attenuate towards the base, 4–16-septate, 60–75 μ long, 3–5 μ thick: hymenial gelatine deep-purple-violet with iodine.—*Verrucaria fuscrobella* Hoffm. *Deutschl. Fl.* ii. 175 (1795). *Lecidea fuscrobella* Cromb. in *Grevillea* xxii. 58 (1893).

A rare lichen. Arnold gives as the chief distinction between it and allied lichens the reaction of the hypothecium with potash, probably indicating the presence of parietin.

Hab. On the bark of trees.—*Dist.* Rare in S. and Central England.—*B. M.* Near Stoney Cross, New Forest, Hants; Malvern, Worcestershire.

8. **B. herbarum** Arn. in *Flora* xlviii. 596 (1865).—Thallus effuse, very thin, granulose, greyish-white (K —, CaCl —), often obsolete. Apothecia moderate in size, sessile, at first prominent and almost closed, with a shining margin, at length convex and immarginate, reddish or dark-red; hypothecium brownish- or reddish-yellow; paraphyses coherent, slightly clavate at the apices; epithecium colourless; spores acicular, straight or somewhat flexuose, narrower at the apices, 3–5- or usually 5–7-septate, 38–56 μ long, 1–2 μ thick: hymenial gelatine blue then sordid-wine-red with iodine.—*Secoliga herbarum* Stiz. in *Acad. Cæs.-Leop. Nov. Act.* xxx. 3, 46 (1863). *Lecidea herbarum* Cromb. in *Journ. Bot.* xii. 148 (1874); Leight. *Lich. Fl.* ed. 3, 372.

Exsicc. *Larb. Lich. Hb.* n. 350.

Stizenberger considered this plant to be intermediate between *B. effusa* or *B. fuscrobella* and *B. muscorum*, agreeing with the latter in habitat and colour of the older apothecia, but approaching

more nearly to *B. effusa* in the form and size of the spores. The thallus varies from being very granular and contiguous to dispersed, scanty, or obsolete.

Hab. Incrusting decaying mosses on granitic rocks in maritime tracts.—*Distr.* Local and scarce in the Channel Islands.—*B. M.* Near Rozel, Jersey; Port Gorey and the Eperquerie, Sark.

9. *B. effusa* Arn. in Flora xli. 505 (1858).—Thallus effuse, thin, crustaceous, scurfy, yellowish-green or whitish, sometimes scarcely visible. Apothecia rather small, scattered or sometimes several aggregate, at first plane with a thickish margin, then convex and immarginate, pale-yellowish-flesh-coloured, sometimes becoming reddish-brown or almost black; hypothecium colourless; paraphyses slender, subdiscrete, colourless, the epithecium sometimes thinly brownish; spores narrowly clavate, straight or slightly curved, pluri-septate, usually about $45\ \mu$ long, $1-2\ \mu$ thick, sometimes shorter or sometimes longer; hymenial gelatine and asci blue with iodine.—*Lichen effusus* Sm. Engl. Bot. t. 1863, two upper figures (1808). *Biatora effusa* var. *intermedia* Hepp ex Stiz. in Acad. Cæs. Leop. Nov. Act. xxx. 3, 42, t. 2, f. 17 (1863). *Lecidea effusa* Leight. Lich. Fl. 343 (1871) (excl. vars.); ed. 3, 370 (excl. vars.); Cromb. in Grevillea xxii. 58 (incl. var. *intermedia*, excl. vars. *arceutina* and *hypnæa*). *L. intermedia* Leight. Lich. Fl. ed. 3, 368 (1879).

Exsicc. Larb. Lich. Hb. n. 233; Lich. Cæsar. n. 74.

Resembles *B. arceutina* in the character of the thallus and the long, narrow spores, but differs in the constantly lighter coloured apothecia, which in some specimens become brownish.

Hab. On trees, leather, etc.—*Distr.* Rare in the Channel Islands, England, Wales and Ireland; not recorded from Scotland.—*B. M.* New Forest, Hants; Somerton, Somerset; Stowell Park, Gloucestershire; Penmaenmawr, Carnarvonshire; Cliffrigg, Cleveland, Yorkshire; Westport, Mayo; Lough Feagh, Connemara, Galway.

Form *hemipolia* A. L. Sm.—Thallus thin, whitish-grey, smooth. Apothecia convex, semiglobose, partly pale-brownish, partly livid; epithecium yellowish; otherwise as in the species.—*Lecidea arceutina* f. *hemipolia* Nyl. in Flora lii. 413 (1869) nomen.

Characterized by the colour of the epithecium and of the constantly convex apothecia.

Hab. On the bark of trees in maritime districts in S. England.—*B. M.* Near Lymington, Hants.

10. *B. latebricola* Wheld. & Trav. in Journ. Linn. Soc. (Bot.) xliii. 127 (1915).—Thallus greenish-yellow, granular-leprose, effuse (K —, CaCl —). Apothecia rare, minute, at first flesh-coloured, then livid, blackish when old; hypothecium almost colourless; paraphyses clavate, colourless, with colourless epi-

thecium; asci cylindrical-clavate, 35–45 μ long; spores narrowly-clavate, mostly obtuse at one end, narrowing at the other, variously curved, rarely straight, slender, 5–11-septate, 26–43 μ long, 1–2 μ thick; hymenial gelatine scarcely blue then wine-red with iodine.—A. L. Sm. Monogr. i. 476 (1918).

Near to *B. herbarum* or *B. effusa*, but differing in the characters of thallus and apothecia. The spores, as in some other *Bacidie*, are variable in form.

Hab. On decayed mosses and humus on sand-dunes, or on broken sandy banks overhung by herbage.—*Distr.* Rare in W. England (Lancashire) and N. Wales (Anglesea).—*B. M.* Formby, Lancashire.

11. *B. prasinoides* Oliv. Exp. Syst. Lich. ii. 26 (1900).—Thallus effuse, thin or very thin, subgranulate-leprose, greenish. Apothecia minute, somewhat plane, obtusely or obsoletely margined, pale-flesh-coloured; hypothecium colourless; paraphyses slender, colourless at the apices; spores rod-shaped or subfusiform, 1–3-septate, 12–21 μ long, 2.5–3.5 μ thick; hymenial gelatine and asci wine-red with iodine.—*Lecidea prasinoides* Nyl. in Flora xlviii. 146 (1865); Carroll in Journ. Bot. vi. 100 (1868); Cromb. Lich. Brit. 74; Leight. Lich. Fl. 326; ed. 3, 345.

Hab. On rocks.—*B. M.* Dinish, Killarney, Kerry.

12. *B. carneoglaucia* A. L. Sm.—Thallus determinate, thin, subleprose, glaucous-green (K —, CaCl —), limited at the circumference by a white hypothallus. Apothecia minute, convex, immarginate, pale- or dull-flesh-coloured; hypothecium and epithecium colourless; paraphyses not well discrete; spores narrowly fusiform, 1.5-septate, 25–40 μ long, 3.5 μ thick; hymenial gelatine bluish then tawny-yellow with iodine.—*Lecidea carneoglaucia* Nyl. in Flora lvi. 295 (1873); Cromb. in Grevillea ii. 90; Leight. Lich. Fl. ed. 3, 366.

Exsicc. Larb. Lich. Hb. without number.

In our specimens the spermatogones alone are present: they are minute, urceolate and pale-flesh-coloured with a pale margin; spermatia oblong, 4–5 μ long, 1.5 μ thick.

Hab. On siliceous rocks. —*B. M.* Rozel, Jersey (the only locality).

13. *B. chlorotricula* A. L. Sm.—Thallus effuse, very thin, subleprose, greenish (K —, CaCl —). Apothecia very minute, plane, margined, whitish-flesh-coloured, the margin whitish; hypothecium colourless; paraphyses not well discrete; spores thin, acicular, straight or slightly bent, 20–35 μ long, 1 μ thick; hymenial gelatine wine-reddish with iodine.—*Lecidea chlorotricula* Nyl. in Flora lx. 564 (1877); Cromb. in Grevillea vi. 112; Leight. Lich. Fl. ed. 3, 254.

Exsicc. Larb. Lich. Hb. n. 138.

Closely allied to *B. inundata*, differing in the very minute pale-coloured *Peziza*-like apothecia. In our specimen the greenish thallus

spreads over the stone, and the apothecia are crowded in one small group. The spores are faintly but quite distinctly pluri-septate, and the slender arcuate spermatia measure up to $50\ \mu$ long, $8\ \mu$ thick.

Hab. On mica-schist rocks.—*B. M.* Mweelan, Connemara, Galway (in a stream); Lough Tay, Wicklow (submerged in summer).

14. *B. carneoalbans* A. L. Sm.—Thallus greenish-glaucous, thin, effuse, granulose (K + yellow, CaCl + red). Apothecia pale-flesh-coloured, sometimes becoming partly dark-coloured, convex, immarginate; hypothecium colourless; paraphyses concrete, colourless at the apices; spores elongate-fusiform, 3-7-septate, $23-27\ \mu$ long, $2.5-3.5\ \mu$ thick; hymenial gelatine tawny-wine-red with iodine, especially the asci which are at first blue at the tips.—*Lecidea carneoalbans* Nyl. in *Flora* lix. 307 (1876); Cromb. in *Grevillea* v. 26; Leight. *Lich. Fl.* ed. 3, 365.

Near to *B. inundata*, but differs in the lighter-coloured apothecia and in the form of the spores, which are straight and slightly narrower at one end. The paraphyses are yellow in the mass.

Hab. On water-washed rocks in a maritime district.—*B. M.* Killery Bay, Connemara, Galway (the only locality).

15. *B. scopulicola* A. L. Sm.—Thallus effuse, granular-verrucose, unequal, greyish- or brownish-green. Apothecia small, at first plane and obtusely margined, then convex and immarginate, brownish-flesh-coloured; epithecium colourless; hypothecium colourless (the subhymenial layer tawny-brownish); paraphyses slender; spores acicular, thinly or obsoletely 3-5-septate, $32-44\ \mu$ long, $2\ \mu$ thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*Lecidea scopulicola* Nyl. in *Flora* lvii. 312 (1874); Cromb. in *Grevillea* iii. 23; Leight. *Lich. Fl.* ed. 3, 368.

Distinguished from the preceding species by the more developed thallus and longer spores.

Hab. On soil on maritime rocks in S. England.—*B. M.* Rosemodris Cliff, Penzance, Cornwall (the only locality).

16. *B. inundata* Koerb. Syst. Lich. Germ. 187 (1855).—Thallus effuse, granulose or rimose-areolate, greenish (K —, CaCl —). Apothecia minute, subinnate-sessile, at first concave and thinly margined, at length convex and immarginate, pale-brown, leaden-coloured, dark-red or finally blackish; hypothecium pale; paraphyses coherent, colourless at the apices; spores straight or curved, elongate, attenuate at the apices, 3-7- (or more)-septate, $34-50\ \mu$ long, $1.5-2.5\ \mu$ thick; hymenial gelatine bluish then wine-red or violet with iodine.—*B. luteola* var. *inundata* Mudd Man. 183 (1861). *Biatora inundata* Fr. in *Vet. Acad. Handl.* 1822, 270. *Lecidea inundata* Nyl. in *Flora* lviii. 106 (1875); Cromb. in *Grevillea* xxii. 58. *L. arceutina* Nyl.

f. inundata Cromb. Lich. Brit. 73 (1870). *L. effusa* var. *inundata* Leight. Lich. Fl. 344 (1871); ed. 3, 371.

Exsicc. Mudd n. 149.

The thallus, occasionally little developed, varies somewhat in thickness, and when dry is often tawny-greenish. It is usually well fertile; the apothecia are very variable in colour in different specimens; the spores are often curved to an S-shape. The spermogones are frequent with curved spermatia, 2.5–3 μ long, .6 μ thick.

Hab. On rocks and boulders, at times inundated, in maritime and upland tracts, also on moist wood.—*Distr.* Seen only from a few localities in Great Britain and Ireland; no doubt often overlooked.—*B. M.* Malpas, near Truro, and Mt. Edgecumbe, Cornwall; Fishguard Harbour, Pembrokeshire; near Ayton and Airyholme Wood, Cleveland, Yorkshire; Teesdale, Durham; near Hexham, Northumberland; near Ballachulish, Argyll; Glen Lochay, Killin, Perthshire; Glen Callater, Braemar, Aberdeenshire; Killery Bay and Lettermore, Connemara, Galway.

Subsp. *allecta* A. L. Sm.—Apothecia white-flesh-coloured; spores acicular, thin, 56–70 μ long, 1 μ thick; otherwise as in the species.—*Lecidea inundata* subsp. *allecta* Nyl. in Flora lx. 567 (1877); Cromb. in Journ. Bot. xx. 275 (1882) & in Grevillea xxii. 58. Specimen not seen.

Characterized by the paler colour of the apothecia and the thinner, longer acicular spores. Spermatia as in the species.

Hab. On siliceous rocks in a maritime district.—*Distr.* Local and scarce in W. Ireland (Kylemore, Galway).

(b) Apothecia dark-coloured.

17. *B. caligans* A. L. Sm.—Thallus indeterminate, thinnish, rugose, deeply cracked, fuliginous-black (K —, CaCl). Apothecia small, plane, obtusely margined, blackish; hypothecium colourless (the perithecium somewhat brownish above); paraphyses concrete, colourless at the apices; spores thinly acicular, indistinctly septate, 30–35 μ long, 1.5 μ thick; hymenial gelatine wine-reddish with iodine.—*Lecidea caligans* Nyl. in Flora lvii. 10 (1874); Cromb. in Grevillea ii. 140 & xxii. 58; Leight. Lich. ed. 3, 283, 371.

Closely resembling *B. inundata*. The dark colour of the thallus is due to the presence of blue-green algae.

Hab. On rocks in a maritime district.—*B. M.* Island of Alderney (the only locality.)

18. *B. egenula* Th. Fr. Lich. Scand. 363 (1874).—Thallus very thinly granulose, greyish (Kf + yellowish), nearly obsolete. Apothecia small, plane, obtusely margined, at first brown then blackish or dark-brown, the margin thickish, at length evanescent; hypothecium brownish; paraphyses loosely coherent, clavate-capitate and colourless at the apices, the epithecium brown;

spores acicular, simple or indistinctly septate, 20–40 μ long, 1.5–2 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea egenula* Nyl. in Flora xlviii. 147 (1865). *L. Leightoniana* Larb. ex Leight. Lich. Fl. ed. 3, 368 (1879); Cromb. in Grevillea xxii. 59.

Exsicc. Larb. Lich. Hb. n. 144.

Allied to *B. arceutina*, but differs in the much smaller plane darker apothecia, the usually shorter spores, and the colour of the hypothecium. The apothecia are somewhat scattered. In *L. Leightoniana* the paraphyses are more discrete. Spores and other characters agree with *B. egenula*.

Hab. On schistose rocks in an upland tract.—*B. M.* Doughruagh Mt. and Lough Feagh, Connemara, Galway.

19. *B. arceutina* Branth & Rostr. in Bot. Tidsskr. iii. 233 (1869).—Thallus effuse, very thin, smoothish or subgranulose verrucose, whitish or greyish, often evanescent. Apothecia small, sessile, at first plane with darker margin, then convex, immarginate, dark-red or blackish and shining; hypothecium yellowish; paraphyses coherent, the epithecium brown; spores narrowly acicular, straight or slightly curved, 3–15-septate, 44–54 μ long, 1.5–2.5 μ thick; hymenial gelatine bluish then wine-red or sordid with iodine.—*Lecidea luteola* var. *arceutina* Ach. Meth. 61 (1803) & Lich. Univ. 197; var. *fuscella* Fr. Summa 112 (1846). *L. arceutina* Nyl. in Flora li. 165 (1868); Cromb. Lich. Brit. 73 pro parte. *L. effusa* var. *fuscella* Leight. Lich. Fl. 344 (1871); ed. 3, 371.

Exsicc. Mudd n. 148; Leight. nos. 211, 279.

Hab. On smooth trunks of trees in upland districts, rarely on old palings.—*Distr.* Here and there sparingly in Great Britain, rare in S. W. Ireland.—*B. M.* St. Lawrence and Brading Woods, Isle of Wight; near Lyndhurst, New Forest, Hants; Ilsham, Torquay and Ullacombe, near Bovey Tracey, Devon; Hurstwood, Tunbridge Wells, Sussex; Rayleigh Wood, Maldon, Hadleigh Woods, Langford and Ulting, Essex; Bathampton Downs and Somerton, Somersetshire; North-leach, Colesborne and Rodmarton, Gloucestershire; Warrindon, near Worcester; Dolgelly, Merioneth; Brilley, Radnorshire; Airyholme Wood, Cleveland, Yorkshire; High Force, Teesdale, Durham; Barmaldine, Argyll; near Killin, Ben Lawers and Falls of Moness, Aberfeldy, Perthshire; Abergeldie and Craig Cluny, Braemar, Aberdeenshire; Muckcross Demesne and Upper Lake, Killarney, Kerry.

Form *deminuta* Th. Fr. Lich. Scand. 353 (1874).—Apothecia small, plane or concave and marginate.—A. L. Sm. Monogr. i. 476 (1918). *Lecidea arceutina* f. *deminuta* Stirt. Scott. Nat. v. 220 (1880). Specimen not seen.

Stirton notes that the spores are 45–60 μ long, 1–1.5 μ thick, and scarcely septate.

Hab. On bark.—*Distr.* N. Scotland (Forres, Elgin),

Form **brevispora** Wheld. & Trav. in Journ. Linn. Soc. (Bot.) xliii. 127 (1915).—Differs from the species in the shorter more strongly curved spores; they measure 25–38 μ long, 1.2–2.5 μ thick, and are usually obscurely 7-septate. A. L. Sm. l. c.

Hab. Incrusting decayed mosses on sand-dunes.—*Distr.* W. England (Freshfield, Lancashire).

Var. **hypnæa** A. L. Sm.—Thallus very thin, granulose-verrucose. Apothecia at length convex, brown or blackish; spores 45–70 μ long; hymenial gelatine bluish with iodine.—*Lecidea arceutina* var. *hypnæa* Nyl. in Flora li. 165 (1868). *L. effusa* var. *arceutina* f. *hypnæa* Cromb. in Grevillea xxii. 58 (1893).

Exsicc. Larb. Lich. Cæsar. n. 80.

Hab. Incrusting mosses and hepatics on soil on shady rocks in maritime localities.—*B. M.* The Warren Noirmont, Jersey; Achill Isl., Mayo.

20. **B. salicicola** Wheld. & Trav. in Journ. Linn. Soc. (Bot.) xliii. 128 (1915).—Thallus scanty or evanescent. Apothecia rather small, varying in colour from red to black; hypothecium colourless; paraphyses conglutinate, the epithecium brown; spores cylindrical or fusiform, often attenuate at one end, generally curved, usually obscurely 7-septate, 25–38 μ long, 2–3.5 μ thick.—A. L. Sm. Monogr. i. 476 (1918).

Differs from *B. arceutina* in the shorter, stouter spores and smaller apothecia.

Hab. On dead twigs and exposed underground stems of *Salix repens* on the coastal sand-hills.—*Distr.* Not uncommon on dunes in W. England.—*B. M.* Formby, Lancashire.

21. **B. epiphylla** Wheld. & Trav. in Journ. Linn. Soc. (Bot.) xliii. 128 (1915).—Thallus almost evanescent, consisting of a few granules, green when fresh, cinereous when dry. Apothecia very minute, black, sessile plane then convex, becoming immarginate, hypothecium pale yellowish-brown; asci narrow, 47 μ long, paraphyses clavate and mostly colourless at the tips, the epithecium pale yellowish-brown; spores slender, acicular, often curved at one end, multiseptate, 33–45 μ long, 1–2 μ thick. A. L. Sm. Monogr. i. 476 (1918). Specimen not seen.

Differing from *B. arceutina* in the smaller apothecia, in the absence of any red tinge, the shorter spores and in the peculiar habitat.

Hab. On fallen leaves of *Salix repens* on sand-dunes. (Ainsdale, Lancashire.)

22. **B. Beckhausii** Koerb. Parerg. Lich. 134 (1860).—Thallus effuse, granular, unequal, whitish or greyish or evanescent (K —, CaCl —). Apothecia small, at first plane with a thickish margin, becoming convex and immarginate, black or somewhat paler

when moist; hypothecium colourless or pale-brownish; paraphyses confluent, olive- or greenish-black towards the apices (K + violet); spores rod-shaped, blunt at the ends, 2-7-septate, 16-32 μ long, 2-3 μ thick; hymenial gelatine pale-bluish then wine-red with iodine.—*Biatora stenospora* Hepp Flecht. Eur. n. 516 (1860). *Lecidea umbrina* subsp. *bacillifera* Nyl. Lich. Scand. 210 (1861). *L. bacillifera* Carroll in Journ. Bot. iii. 290 (1865); Cromb. Lich. Brit. 74 pro parte & in Grevillea xxii. 59; Leight. Lich. Fl. 342; ed. 3, 370 (incl. var. *alpina*). *Biatora pezizoidea* var. *alpina* Hepp ex Stiz. in Acad. Cæs. Leop. Nov. Act. xxx. 3, 15 (1863). *L. stenospora* Nyl. in Flora lii. 413 (1869); Cromb. in Grevillea xxii. 59.

Exsicc. Larb. Lich. Hb. n. 316.

Distinguished by the somewhat narrow hymenium, with shorter asci and spores, and by the dark colour of the epithecium which gives a violet reaction with potash that penetrates downwards. A form with rather large apothecia scattered or aggregate in small groups was found by Crombie parasitic on the squamules of *Cladonia pyxidata* var. *pocillum*.

Hab. On bark of trees.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Near Lyndhurst, Hants; Brandon Park, Suffolk; Dolgelly, Merioneth; Stogdale and Kildale, Cleveland, Yorkshire; Aberfeldy, Perthshire; Barcaldine, Argyll.

Var. *poliæna* Arn. in Flora liv. 53 (1871).—Thallus as in the species. Apothecia pallid, leaden-coloured or subolivaceous, usually whitish-pruinose.—*Bacidia luteola* var. *cæsiopruinosa* Mudd Man. 183 (1861) (excl. *hab.* on rocks). *Lecidea umbrina* subsp. *poliæna* Nyl. Lich. Scand. 210 (1861). *L. effusa* var. *cæsiopruinosa* Leight. Lich. Fl. 344 (1871); ed. 3, 371.

Exsicc. Leight. n. 150 (as *Biatora luteola*); Mudd n. 150.

Hab. On trees.—*Distr.* Rare in W., central and N. England.—*B. M.* Near Dursley, Gloucestershire; Broome, Shropshire; Pirton, near Worcester; Cleveland and Stogdale, Yorkshire.

23. *B. incompta* Anzi Cat. Lich. Sondr. 70 (1860).—Thallus effuse, thinnish, granulose-pulverulent, greyish-green (K —, CaCl —). Apothecia small, adnate or appressed, black or purplish-black, plane and thinly margined, the margin flexuose, at length somewhat convex, difform, and immarginate (K + reddish-violet); hypothecium thick, reddish-black; paraphyses coherent, sordid-reddish; spores shortly acicular, 1-7- usually 3-septate, 15-29 μ long, 2-3 μ thick; hymenial gelatine pale-bluish then wine-red with iodine.—Mudd Man. 184 (? excl. var. *atrosanguinea*). *Lecidea incompta* Borr. in Engl. Bot. Suppl. t. 2699 (1831); Hook. in Sm. Engl. Fl. v. 180; Leight. Lich. Fl. 325; ed. 3, 345; Cromb. in Grevillea xxi. 59. *L. umbrina* subsp. *bacillifera* var. *incompta* Nyl. Lich. Scand. 210 (1861). *L. bacillifera* subsp. *incompta* Cromb. Lich. Brit. 74 (1870) (incl. f. *minor*).

Exsicc. Leight. n. 162; Mudd n. 151; Larb. Lich. Hb. n. 174.

The apothecia are numerous and sometimes several confluent; they are well characterized by the reddish colour internally. The thallus is usually well developed, closely covering the inequalities of the bark, but a state has been found growing on wood where it is reduced to a few granules. Form *minor* (*Secoliga atrosanguinea* var. *incompta* f. *minor* Stiz. in Acad. Cæs. Leop. Nov. Act. xxx. 3, 20 (1863)) is distinguished by the finer granules of the thallus and the smaller apothecia.

Hab. On the trunks of old trees in maritime and upland wooded districts.—*Distr.* Uncommon in England, though plentiful where it occurs; rare in Scotland, Ireland, and the Channel Islands.—*B. M.* Near Rozel, Jersey; Penshurst, Kent; near Shanklin, I. of Wight; Lyndhurst, New Forest, Hants; near Exeter, near Newton Abbot and Ugbrook Park, Devon; near St. German's, Cornwall; Albourne, Glynde, Danny and Wakehurst, Sussex; Gosfield Hall, Essex; Thorngate, near Cirencester, Gloucestershire; Oswestry, Shropshire; Wimpole Park, Cambridgeshire; Gopsall Park, Leicestershire; Hindlip and Kempsey, near Worcester; Kildale and Bilsdale, Cleveland, Yorkshire; Nannau, Dolgelly, Merioneth; Barcaldine, Argyll; Adare, Limerick; Dinish, Killarney, Kerry.

24. *B. muscorum* Mudd Man. 184 (1861).—Thallus effuse, thin, granulose, greyish-white or whitish (K —, CaCl —). Apothecia small, at first plane, with thin entire margin, at length convex and immarginate, black; hypothecium dark-reddish-brown, paraphyses loosely coherent, incrassate at the apices, the epithecium blackish; spores bacilliform, straight or slightly curved, 3–7-septate, 27–48 μ long, 2.5–3 μ thick; hymenial gelatine pale-blue then wine-red with iodine.—*Lichen muscorum* Weber Spicil. Goett. 183 (1778)?; Swartz Meth. Musc. 36 (1781); Relhan Fl. Cantab. 424 with fig.; With. Arr. ed. 3^d, iv. 7 pro parte; Engl. Bot. t. 626 (spermogoniiferous). *Lecidea muscorum* Ach. Meth. 33 (1803) pro parte; Hook. in Sm. Engl. Fl. v. 177 pro parte; Leight. Lich. Fl. 342; ed. 3, 370. *L. bacillifera* subsp. *muscorum* Cromb. Lich. Brit. 74.

Exsicc. Leight. n. 190; Mudd n. 152; Larb. Lich. Hb. n. 273 & Lich. Cantab. n. 30; Johns. n. 340.

Differs from the preceding, to which it is closely related, in the colour of the paraphyses and of the epithecium, and more especially in the habitat. The hypothecium gives a crimson coloration with potash. Nylander has marked Mudd's n. 152 as f. *hypothecio pallidiore*.

Hab. Incrusting mosses on the ground and on boulders in maritime and upland situations.—*Distr.* Not unfrequent in England; rare in N. Wales, the S.W. Highlands of Scotland, S. Ireland, and the Channel Islands.—*B. M.* Quenvais, Jersey; Shanklin, I. of Wight; near Hay Tor, Dartmoor, Devon; Hayle and St. Merryn, Cornwall; Patcham, Sussex; Shere, Surrey; Beeleigh, Essex; Bathampton Downs and Claverton Downs, Somerset; near Cheltenham, Gloucestershire; Tenby, Pembrokeshire; Burwell and Gogmagog Hills, Cambridgeshire;

Thetford Warren, Norfolk; Shiffnal, Shropshire; Whitman's Hill, near Malvern, Worcestershire; Dolgelly, Merioneth; Redcar, Cleveland, Yorkshire; Freshfield, Lancashire; East Allendale, Northumberland; Windermere, Westmorland; Appin and Ballachulish, Argyll; Glen Fender, Blair Athole, Perthshire; Blarney, Cork; Croghan, Killarney, Kerry.

Var. *atriseda* Wheld. & Trav. in Journ. Linn. Soc. (Bot.) xliii. 129 (1915).—Thallus effuse, granulose, the granules bright green when moist, cinereous when dry, scattered over a black hypothallus. Apothecia solitary or aggregate, at first pale-tawny, becoming black, with a thin margin, becoming convex, immarginate and difform. Hypothecium reddish-brown; hymenium brownish, the epithecium blackish; spores straight or slightly curved, acute at one end or sometimes with an appendage at each end, 30–39 μ long, 2.3 μ thick.—A. L. Sm. Monogr. i. 471 (1918). Specimen not seen.

Forming patches which appear blackish owing to the dark hypothallus. It differs from the species in colour and habitat, and in the spore appendages, which, however, suggest germination.

Hab. Associated with *Cladonia pyxidata* on decaying mosses and thin moist humus on bare low *Salix repens* dunes. (Formby, Lancashire, Oct. 1907 and Jan. 1914).

25. *B. atosanguinea* Th. Fr. Lich. Scand. 354 (1874).—Thallus effuse, thin or thickish, verrucose, pale or whitish (K —, CaCl —), often little visible. Apothecia small, plane, thinly margined, black or blackish; paraphyses thickish, often bluish at the apices; hypothecium purple- or reddish-brown; epithecium aeruginous-black; spores acicular, 3–7-septate, 22–44 μ long, 2.5–3.5 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Biatora atosanguinea* Hepp Flecht. Eur. n. 286 (1857). *Lecidea subincompta* Nyl. in Flora xlviii. 147 (1865); Cromb. in Grevillea xxii. 59.

Classified by some recent writers as *B. affinis*. There is no specimen in our British collection, but it has probably been overlooked, as it is common on the continent. *B. incompta* var. *atosanguinea* Mudd Man. 184 may be a synonym, but a specimen in the herbarium so named by him is identical with *B. incompta*.

Hab. On the bark of trees.

Subsp. *oribata* A. L. Sm.—Thallus thinly subgranulose-verrucose, greyish-brown. Spores 3–5-septate, 23–40 μ long, 3–4 μ thick; otherwise as in the species.—*Lecidea oribata* Nyl. in Flora lvii. 16 (1874); Leight. Lich. Fl. ed. 3, 372. *L. subincompta* subsp. *oribata* Cromb. in Grevillea ii. 141 (1874) & xxii. 59.

Apparently, as Nylander himself says, only a subspecies differing chiefly in the more developed thallus and the rather smaller spores and in the habitat.

Hab. On the ground among schistose rocks in a mountainous region.—*B. M.* Ben Lawers, Perthshire (collected by Stirton).

26. *B. circumpallens* A. L. Sm.—Thallus effuse, thin, rimose, pale-greyish. Apothecia small, plane or subconvex, brownish-black or brownish-red, the margin pale, at length excluded, hypothecium colourless; paraphyses thickish, somewhat lax; epithecium vaguely dark or almost colourless; spores fusiform or fusiform-acicular, straight, 3-septate, 18–25 μ long, 2–3.5 μ thick; hymenial gelatine pale-bluish then wine-red with iodine.—*Lecidea circumpallens* Nyl. in Flora xlix. 370 (1866); Carroll in Journ. Bot. v. 256 (1867); Leight. Lich. Fl. 336; ed. 3. 358. *L. bacillifera* var. *circumpallens* Cromb. Lich. Brit. 74 (1870); subsp. *circumpallens* Cromb. in Grevillea xxii. 58 (1893).

Hab. On clayey soil.—*Distr.* Rare in W. Ireland.—*B. M.* Ross and Kilkee, Clare.

27. *B. atrogrisea* Arn. in Flora xli. 505 (1858).—Thallus determinate or subeffuse, thin, rimulose or granulose, greyish-white or greenish-grey. Apothecia sessile, or adnate, at first plane with thick, smooth margin, at length somewhat convex, the margin excluded, black or purplish-black; hypothecium colourless, reddish below; paraphyses slender, subdiscrete, clavate and bluish-black at the apices (K \mp purplish-violet); spores elongate-acicular, 3–15-septate, straight or slightly curved, tapering downwards, 40–70 μ long, 3–5 μ thick; hymenial gelatine bluish then sordid wine-red with iodine.—Mudd Man. 183. *Biatora atrogrisea* Delise ex Hepp Flecht. Eur. n. 26 (1853). *Lecidea luteola* f. *endoleuca* Nyl. Bot. Not. 1853. 98; var. *endoleuca* Nyl. in Act. Soc. Linn. Bord. sér. 3. i. 360 (1856). *L. endoleuca* Nyl. ex Carroll in Nat. Hist. Rev. 1859. 527; Cromb. Lich. Brit. 74; Leight. Lich. Fl. 340; ed. 3. 367.

Ersice. Carroll Lich. Hib. n. 23; Leight. n. 90 (as *Biatora premnea*); Larb. Lich. Hb. n. 349; Johns. n. 341.

Hab. On naked or mossy trunks of trees, rarely on stems of ivy, in maritime and upland situations.—*Distr.* Here and there in England, apparently rare in Scotland, more frequent in Ireland.—*B. M.* Withiel, Cornwall; Ilsham Walk, Torquay, Devon; Near Lyndhurst, New Forest, Hants; near Lewes, Selham, Mount Harry and near Hastings, Sussex; Kelvedon, Ulting and Hockley, Essex; Bathampton Downs, Somerset; Oakley Park, Cirencester, Gloucestershire; Twycross, Leicestershire; Hollybush Hill, Malvern, Worcestershire; Nannau and Dolgelly, Merioneth; near Shrewsbury, Shropshire; Airyholme Wood, Cleveland, Yorkshire; near Gosforth, Cumberland; Barealdine, Argyll; Kenmore, Perthshire; Tullagreen and near Rostellan, Cork; Little Island and Dinish, Killarney, Kerry; Malaranny, Achill and Westport, Mayo; Adare, Limerick; Letterfrack, Connemara, Galway; Abbeyleix, Queens Co.

Form *Laurocerasi* A. L. Sm.—Thallus crowdedly rimulose or subleprose, whitish. Apothecia convex, reddish-brown or partly paler, immarginate, whitish within; spores 53–95 μ long, 4–4.5 μ

thick.—*Patellaria Laurocerasi* Duby in DC. Bot. Gall. 653 (1830). *Lecidea endoleuca* f. *Laurocerasi* Nyl. in Flora xlvii. 620 (1864); Cromb. Lich. Brit. 74.

Perhaps rather a state than a distinct form, differing in the lighter-coloured apothecia, which are rather scattered in the two British specimens, and are obtusely margined only in a very young condition. Nylander (*l. c.*) gives the larger spore sizes, usually they are about $65\ \mu$ long.

Hab. On ash and elm in maritime and upland districts.—*Distr.* Rare in S. England and the Channel Islands.—*B. M.* Quenvais, Jersey; near Lyndhurst, New Forest, Hants.

28. *B. umbrina* Branth & Rostr. in Bot. Tidsskr. iii. 235 (1869).—Thallus subeffuse, thin, granulose-leprose or subareolate, dark-greyish, dark-green, blackish or yellowish (K —, CaCl —), sometimes subobsolete. Apothecia small, sessile, plane and thinly margined, at length convex, immarginate, brownish or blackish; hypothecium colourless; paraphyses coherent, olive-brown or dark-greenish-blue at the subclavate apices; spores vermiform-cylindrical, spirally curved, 3–5-pluri-septate, $20\text{--}40\ \mu$ long, $2.5\text{--}3.5\ \mu$ thick; hymenial gelatine bluish then wine-red or violet with iodine.—*Lecidea umbrina* Ach. Lich. Univ. 183 (1810); Carroll in Journ. Bot. v. 255 (1867); Leight. Lich. Fl. ed. 3, 359; f. *vermifera* Nyl. Lich. Scand. 210 (1861). *L. pelidna* Ach. *tom. cit.* 158; Cromb. Lich. Brit. 74; Leight. Lich. Fl. 344. *L. holomelæna* Floerke ex Spreng. Syst. Veg. iv. 256 (1827) pro parte. *L. vermifera* Nyl. in Bot. Not. 1853, 98; Salw. in Trans. Penz. Nat. Hist. Soc. 1853, 143. *L. holomelæna* subsp. *vermifera* Cromb. Lich. Brit. 91 (1871). *Scoliciosporum vermiferum* Mudd Man. 185 (1861).

Exsicc. Leight. n. 158; Mudd n. 153; Johns. n. 342.

Easily recognized by the spirally-curved spores, which are usually pluriseptate, though sometimes apparently simple. The thallus covers the substratum with a thin minutely broken crust. The apothecia are numerous. Leighton's f. *leptomera* (*l. c.*) (*Lecidea leptomera* Sommerf. Suppl. Fl. Lapp. 161 (1826)) has a somewhat lighter thallus. Crombie cites as *Lecidea holomelæna* (*Biatora holomelæna* Hepp Flecht. Eur. n. 12 (1853)), a species that from its two-celled spores belongs to the genus *Biatorina*.

Hab. On rocks and stones, more rarely on old palings.—*Distr.* General and common throughout the British Isles.—*B. M.* Boulay Bay, Jersey; Launceston, Cornwall; Shoreham, Shermanbury and Wisborough Green, Sussex; Cheltenham, Gloucestershire; Barmouth, Merioneth; near Oswestry, Sutton, near Shrewsbury, Stiperstones and Lyth Hill, Shropshire; Malvern, Worcestershire; Snowdon and Trefriw, Carnarvonshire; Buxton, Derbyshire; near Easby, Cleveland, Yorkshire; High Force, Teesdale, Durham; Glen Helen, I. of Man; Kendal, Westmorland; Asby, Cumberland; near Portlethen, Kincardineshire; Canlochan, Forfarshire; Ben Lawers, Glen Fender and Craig Tulloch, Blair Athole, Perthshire; Upper Glen Dee, Braemar, Aberdeenshire;

Glen Nevis, Lochaber, Inverness-shire; Achnasheen, Ross-shire; near Macroom, Cork; Blackwater Bridge, Kerry; Kilkee and Moher, Clare; Kylemore, Connemara, Galway.

Var. *turgida* Th. Fr. Lich. Scand. 365 (1874).—Thallus thin, effuse, crustaceous, minutely granular, light- or dark-greenish-brown. Apothecia small, numerous, paler than in the species; paraphyses paler at the tips.—*Scoliciosporum turgidum* Koerb. Parerg. Lich. 241 (1861). *Lecidea pelidna* var. *turgida* Cromb. Lich. Brit. 74 (1870); Leight. Lich. Fl. 345. *L. pelidniza* Nyl. in Flora lvi. 318 (1874). *L. umbrina* f. *turgida* & *pelidniza* Leight. Lich. Fl. ed. 3, 360 (1879).

Exsicc. Larb. Lich. Hb. nos. 182 & 271 (as *Lecidea subpelidniza*).

Distinguished from the species by the lighter-coloured thallus and apothecia.

Hab. On rocks.—*Distr.* Rare in maritime or upland districts in S. and Central England, Wales, the N. Grampians, Scotland and W. Ireland.—*B. M.* Near Penzance, Cornwall; Dolgelly, Merioneth; Snowdon, Carnarvonshire; Glen Callater, Braemar, Aberdeenshire; Kilkee, Clare; Kylemore and Twelve Pins, Connemara, Galway.

Var. *compacta* Th. Fr. l. c.—Thallus dark-brown, almost black, thickish. Apothecia very dark; paraphyses dark-bluish-green towards the apices.—*Scoliciosporum compactum* Koerb. Syst. Lich. Germ. 268 (1855). *L. umbrina* f. *compacta* Leight. Lich. Fl. ed. 3, 360 (1879).

Exsicc. Johns. n. 427.

Hab. On rocks and walls.—*Distr.* Not unfrequent in England and Wales, rare in the S. Grampians, Scotland and W. Ireland.—*B. M.* Axe Edge, near Buxton, Derbyshire; Dolgelly, Merioneth; Ennerdale, Cumberland; Ben Lawers, Perthshire; near Kylemore, Connemara, Galway.

29. *B. ascaridiella* A. L. Sm.—Thallus determinate, thin, opaque, rimulose, whitish (K —, CaCl —). Apothecia very minute, innate, blackish, colourless within, often with a pseudothalline crenulate margin; epithecium slightly brownish; hypothecium colourless; paraphyses very slender, not crowded, the epithecium slightly brownish; spores 8, 16 or 32 in the ascus, vermiform, acute at the apices, spirally-curved, pluriseptate, 25–30 μ long, 1.5–2 μ thick; hymenial gelatine scarcely tinged with iodine.—*Lecidea ascaridiella* Nyl. in Flora li. 162 (1868); Carroll in Journ. Bot. vi. 100 (1868); Leight. in Ann. Mag. Nat. Hist. ser. 4, i. 483 (1868) & Lich. Fl. 355; ed. 3, 383; Cromb. Lich. Brit. 75.

A very minute lichen, placed by Nylander near to *Lecidea leucaspis*, a continental species. Examination shows that it is closely allied to the preceding; the spores are septate, not simple as originally described. The small specimen seen is well fertile.

Hab. On a calcareous rock in an upland mountainous district.—*B. M.* Mangerton, Killarney, Kerry.

30. *B. flavovirescens* Anzi Cat. Lich. Sondr. 71 (1860).—Thallus bright-greenish-yellow, effuse, thin or thickish, finely granular or pulverulent (K —, CaCl —); hypothallus filamentous, dark-brown or blackish. Apothecia black, solitary or conglomerate, appressed, at first concave, then plane, with a thickish obtuse margin, the disc granular; hypothecium brownish-black; paraphyses slender, hyaline, greenish-yellow in thick section; spores acicular, pluriseptate, 36–100 μ long, 3–4 μ thick; hymenial gelatine not tinged with iodine.—*Lichen flavovirescens* Dicks. Crypt. fasc. iii. 13 t. 8, f. 9 (1793); With. Arr. ed. 3, iv. 12. *L. citrinellus* Ach. in Vet. Acad. Handl. xvi. 135, t. 5, f. 5 (1795); Engl. Bot. t. 1877. *Lecidea citrinella* Ach. Meth. 47 (1803); S. F. Gray Nat. Arr. i. 466; Cromb. Lich. Brit. 94; Leight. Lich. Fl. 339; ed. 3, 336. *L. flavovirescens* Borr. ex Hook. in Sm. Engl. Fl. v. 178 (1833); Tayl. in Mackay Fl. Hib. ii. 122. *Raphiospora flavovirescens* Koerb. Syst. Lich. Germ. 268 (1855); Mudd Man. 186, t. 3, f. 70.

Exsicc. Leight. n. 303.

A conspicuous plant from the contrast between the brightly-coloured, scattered or continuous thallus and the dark substratum, to which it is loosely affixed. On account of the prominent, somewhat carbonaceous margin of the apothecium, and the elongate-acicular spores, it has been variously classified by authors under *Lecanactis* or *Raphiospora*. Th. Fries (Lich. Scand. 343 (1874)) regards *B. flavovirescens* as a discomycetous fungus parasitic on the thallus of *Sphyridium byssoides* (*Bæomyces rufus*). The gonidia, he considers, belong to the latter plant, their bright colour being caused by the action of the parasite on the host. Rehm has included it in his genus *Mycobacidium* (Rabenh. Krypt.-Fl. i. 3, 338 (1896)), but states that the question of parasitism is by no means decided; more recently it has been proved to be a true lichen by Tobler (Pringsh. Jahrb. Wiss. Bot. xlix. 407 (1911)).

Hab. On the ground and among mosses on rocks in hilly or sub-alpine localities.—*Distr.* Apparently local, though plentiful where it occurs in England and Wales, common in the Highlands of Scotland, rare in Ireland.—*B. M.* Hay Tor, Dartmoor and Bovey Tracey, Devon; Builth, Breconshire; Twycross, Leicestershire; Llyn Gwernen and Dolgelly, Merioneth; Oswestry, Shropshire; Bettws-y-Coed, Carnarvonshire; Llangollen, Denbighshire; Staveley, Westmorland; Teesdale, Durham; near Helensburgh, Dumbartonshire; Glen Creran, Argyll; Glen Lochay, Killin, Craig Calliach, Ben Lawers, Rannoch and Craig Tulloch, Blair Athole, Perthshire; Canlochan Glen, Forfarshire; Morrone, Braemar, Aberdeenshire; Hills of Applecross, Ross-shire; Wicklow; near Dunkerron, Kerry; Doughruagh Mt., Connemara, Galway.

Var. *alpina* A. L. Sm.—Thallus areolate, in crumb-like masses, sublobulate at the circumference. Apothecia plane or slightly convex, often congregate.—*Lecidea flavovirescens* var. *alpina* Schær. Spicil. Lich. Helv. 162 (1833).

Distinguished by the more developed thallus. *Lichen flavovirescens* var. 2, With. (*l. c.*) erroneously referred by Crombie (Grevillea

xii. 58) to the variety (as f. *alpina*) is only a more granulose state of the species.

Hab. Incrusting mosses on rocks in an alpine situation.—*B. M.* Near the summit of Ben Lawers, Perthshire.

Var. arenicola A. L. Sm.—Thallus obsolete. Apothecia minute, scattered, the margin slightly inflexed and shining, otherwise as in the species.—*Lecidea citrinella* var. *arenicola* Nyl. ex Mudd Man. 187 (1861); Cromb. Lich. Brit. 94; *L. arenicola* Leight. Lich. Fl. 356; ed. 3, 386. *Raphiospora arenicola* Mudd Man. 186 (1861).

Exsicc. Leight. n. 372.

Differs from the species in the absence of the thallus and in the smaller solitary, though numerous apothecia. The asci are sometimes 6–8-spored or even 4-spored (Leight. *l. c.*).

Hab. On sandy soil and often parasitic, as the thallus of *Bæomyces rufus* in upland hilly districts.—*Distr.* Found only in a few localities of Great Britain and Ireland.—*B. M.* Goyt Lane, Buxton, Derbyshire; Wapley Hill, Herefordshire, Stiperstones, Shropshire; Loundsdale, Cleveland, Yorkshire; Craig Calliach, Ben Lawers and Rannock, Perthshire; Countesswells Wood, near Aberdeen; Mweelan, near Kylemore, Connemara, Galway.

78. **BUELLIA** De Not. in Giorn. Bot. Ital. Ann. 2. I. i. 195 (1846) emend.; Koerb. Syst. Lich. Germ. 223 (1855).—*Diploicia* Massal. Ric. Lich. 86 (1852); Mudd Man. 168. *Abrothallus* De Not. *l. c.* 192; Mudd Man. 224. (Pl. 12.)

Thallus radiate-plicate (*Diploicia*), crustaceous or wanting (*Abrothallus*). Algal cells Protococcaceæ. Apothecia usually dark-coloured and carbonaceous, immarginate or with a proper margin only; asci usually 8-spored; spores ellipsoid or oblong, usually 1-septate, brown (colourless at first in *B. colludens* and *B. confervoides*), sometimes with a hyaline epispore (*halonate*).

Diploicia and *Abrothallus* have been included in *Buellia* on account of the similarity in the fruits. The species of *Abrothallus* are all parasitic on other Lichens, and have been described as fungi by some authors. They are lichenoid in development.

Thallus squamulose.

1. **B. canescens** De Not. in Giorn. Bot. Ital. Ann. 2. I. i. 197 (1846).—Thallus determinate, thickish, white or glaucous-white, adnate, usually orbicular, radiate-plicate and lobate at the circumference, generally smooth, pruinose, sorediate towards the centre (K + yellow, CaCl —). Apothecia rather rare, black, small, crowded towards the centre, adnate, plane and thinly margined, becoming slightly convex and immarginate; hypothecium brownish-black; paraphyses subdiscrete, thick and black at the apices; spores oblong-ellipsoid, obtuse at the ends, brown or blackish-brown, 11–14 μ long, 6–7 μ thick; hymenial gelatine

deep-blue with iodine.—*Lichenoides crustosum, orbiculare incanum* Dill. Hist. Musc. 135, t. 18, f. 17A (1741). *Lichen canescens* Dicks. Pl. Crypt. i. 10, t. 2, f. 5 (1785); With. Arr. ed. 3, iv. 9; Engl. Bot. t. 582. *L. incanus* Relh. Fl. Cantab. 424 (1785)? *Lecidea canescens* Ach. Meth. 83 (1803); Tayl. in Mackay Fl. Hib. ii. 130; Cromb. Lich. Brit. 76; Leight. Lich. Fl. 302; ed. 3, 313. *Placodium canescens* DC. Fl. Franc. ii. 379 (1805); Hook. in Sm. Engl. Fl. v. 197. *Lepidoma canescens* S. F. Gray Nat. Arr. i. 462 (1821). *Diploicia canescens* Massal. Ric. Lich. 86, fig. 177 (1852); Mudd Man. 169, t. 3, fig. 60.

Ersicc. Dicks. Hort. Sicc. Brit. n. 24; Leight. n. 62; Larb. Lich. Hb. n. 104 & Lich. Cæsar. n. 33; Carroll Lich. Hib. n. 18; Cromb. n. 178.

Apt at first sight to be confused with *Lecania candicans*, but well distinguished by the form of the black apothecia and the dark-coloured spores.

Hab. On old trees, rocks, and walls.—*Distr.* Frequent in the Channel Islands, England, and Ireland; somewhat rare in Scotland and Wales.—*B. M.* Huet Bay, Guernsey; Fliquet Bay, Jersey; Sark; I. of Wight; near Penzance and St. Minver, Cornwall; Tregantle, Devon; Netley Abbey and near Lymington, Hants; Glynde, Beeding Priory, Hurstpierpoint, Aldrington, Angmering, Boxgrove, Ardingly, and near Lewes, Sussex; Shere and near Cheam, Surrey; Hythe, Lydd, and Penshurst, Kent; near Hendon, Middlesex; Danbury Park, Ulting, and Walthamstow, Essex; near Elstree, Herts; Windsor Great Park, Berks; Lechlade, Gloucestershire; Whittington and Norton, Worcestershire; Gopsall Park and Twycross, Leicestershire; Dolgelly and Aberdovey, Merioneth; Wimpole Park and Gamlingay, Cambridgeshire; Ickworth, Suffolk; Yarmouth and Eaton, Norfolk; Baston Hill, Lincoln; Pwllheli, Carnarvonshire; Harboro' Magna, Warwickshire; Clifton Grove, Nottinghamshire; near Ayton, Cleveland, Yorkshire; Gainsford, Durham; Hexham, Northumberland; Levens Park, Westmorland; Queen's Park, near Edinburgh; Den of Mains, Forfarshire; Nigg, Kincardineshire; Ballachulish, Argyll; Agharda and Middleton, Cork; Dromoland, Clare; The Bills, near Clare Island, Mayo; Carrigounnel, Limerick; Coolmore, Donegal.

Var. erubescens A. L. Sm.—Similar to the species, differing only in the colour of the medulla, which is a faint rose-red. The whole thallus gives a yellow reaction with potash. Spores about 12–15 μ long, 6–8 μ thick.—*Lecidea erubescens* Stirton in Trans. Bot. Soc. Edin. xiv. 361 (1883).

Hab. Rare in S.W. Scotland.—*B. M.* Dundrennan Abbey, Kirkcudbrightshire.

2. *B. epigæa* Tuckerm. Gen. Lich. 185 (1872).—Thallus whitish, orbicular, radiate-plicate at the circumference, farinose sometimes reduced to scattered squamules. Apothecia black, sessile, plane, becoming convex, whitish- or bluish-pruinose, the margin thin, at first prominent, at length disappearing; hypothecium brown or blackish-brown; paraphyses loosely coherent,

often septate, dark-brownish-black at the apices; spores ellipsoid, obtuse at the ends, sometimes constricted in the middle, 16-21 μ long, 7-9 μ thick.—*Lichen epigæus* Pers. in Ust. Ann. vii. 25, (1794). *Lecidea epigæa* Schær. Spicil. Lich. Helv. 118 (1828).

Exsicc. Larb. Lich. Hb. n. 312.

Somewhat similar to the preceding, but differs in the non-sorediate thallus and the larger spores.

Hab. On the ground.—*B. M.* Lakenheath Warren, Suffolk; Thetford Warren, Norfolk.

Thallus crustaceus.

(a) *Hypothecium light-coloured.*

3. *B. alocizoides* A. L. Sm.—Thallus whitish-grey, thin, tartareous, pulverulent or almost evanescent (K —, CaCl —). Apothecia scattered, punctiform, immersed, then superficial, adnate, plane, brownish-black (paler when moist), with a paler margin; hypothecium colourless or faintly brownish; paraphyses subdiscrete, clavate and brown at the apices; spores rounded-oblong, dark-brown, 14-16 μ long, 7-9 μ thick.—*Lecidea alociza* Cromb. in Journ. Bot. ix. 178 (1871) (non Massal.); Leight. Lich. Fl. 310. *L. alocizoides* Leight. Lich. Fl. ed. 3, 325 (1879). *Verrucaria Leightonii* Deakin in Ann. Mag. Nat. Hist. ser. 2 xiii. 34, t. 1, fig. 3 (1854)?

Characterized by the absence of areolation in the thallus and the minute emerging apothecia with colourless hypothecium.

Hab. On rocks chiefly calcareous.—*Distr.* Rare in central England and N. Wales.—*B. M.* I. of Man; Anglesea; Llandudno, Carnarvonshire; Buxton, Derbyshire.

4. *B. spuria* Koerb. Parerg. Lich. 183 (1860).—Thallus dull-ash-greyish, smooth and cracked, areolate or in scattered warts and granules; hypothallus blackish. Apothecia black, small, appressed or somewhat prominent, plane, with a thin evanescent margin; hypothecium colourless or brownish; paraphyses loosely coherent, dark-brown or olive-brown at the clavate apices; spores ellipsoid or oblong-ellipsoid, obtuse at the ends, somewhat slightly constricted, dark-brown 8-15 μ long, 4-7 μ thick.—*Lecidea spuria* Schær. Spicil. Lich. Helv. 127 (1828) & Enum. 114 (1850); Leight. Lich. Fl. ed. 3, 318 pro parte. *Buellia verruculosa* var. *spuria* Mudd Man. 215 (1861).

Exsicc. Leight. n. 217 pro parte.

Distinguished from *B. verruculosa*, a variety of which Mudd regarded it, by the lighter-coloured hypothecium.

Hab. On rocks.—*Distr.* Rare in W., Central and N. England and Wales; not recorded from Scotland or Ireland, but probably overlooked.—*B. M.* Lynmouth, Devon; Lyth Hill, Shropshire; Barmouth, Merioneth; Carlton Bank, Cleveland and near Ayton, Yorkshire;

Silloth, Cumberland; Port Greenaugh, I. of Man; Kinloch Rannoch, Perthshire; Clare Island, Mayo.

5. **B. occulta** Koerb. Parerg. Lich. 186 (1860).—Thallus greyish-yellow, effuse, thin, minutely cracked-areolate, the areolæ somewhat convex (K + yellow, CaCl —); hypothallus black. Apothecia minute, blackish-brown, adnate and margined by the thallus, becoming convex, the proper margin more or less visible; hypothecium yellowish; paraphyses indistinct, dark-brown and clavate at the tips; spores ellipsoid, 14–17 μ long, 7–8 μ thick.—*Lecidea occulta* Leight. in Grevillea i. 58, t. 4, f. 6 (1872), & Lich. Fl. ed. 3, 325. *L. leucoclinella* Nyl. ex Cromb. in Journ. Bot. ix. 179 (1871) & xi. 135 (1873); Leight. Lich. Fl. 310; ed. 3, 325.

Exsicc. Leight. n. 217 pro parte.

Differs from the preceding in the colour of the thallus, which is thinner and often somewhat scattered. Crombie (*l. c.*) included Leighton's *Exsicc.* n. 189 (*L. verruculosa*) under *L. leucoclinella*, but the British Museum specimen is a form of *Rhizocarpon confervoides*. The specimens in the herbarium were collected by Leighton except the one from Ayton determined by Mudd as *B. verruculosa*.

Hab. On rocks.—*Distr.* Rare in Central England and Wales.—*B. M.* Lyth Hill, Shropshire; Bettws-y-Coed, Carnarvonshire; near Ayton, Cleveland, Yorkshire.

6. **B. discolor** Koerb. Parerg. Lich. 185 (1860).—Thallus pale-greyish-brown, thin, tartareous, minutely cracked-areolate or almost continuous, the areolæ plane (K + yellow, CaCl + yellow), limited by a more or less conspicuous dark-brown hypothallus. Apothecia blackish-brown, minute, numerous, adnate or subinnate, plane with a thickish persistent margin; hypothecium colourless; paraphyses distinct, dark-brown at the apices; spores ellipsoid, almost colourless, then dark-brown, the large guttulæ of the cells connected by a tube, 19–21 μ long, 10–11 μ thick.—*Lecidea discolor* Hepp Flecht. Eur. nos. 319 & 320 (1857); Leight. Lich. Fl. ed. 3, 325.

Exsicc. Johns. n. 356.

Hab. On rocks and stones.—*Distr.* Somewhat rare in S. and N. England and S. Ireland.—*B. M.* Sussex Downs; Sunny Brow and near High Reston, Staveley, Westmorland; sea-banks between Whitehaven and St. Bees, Cumberland.

7. **B. interpolata** A. L. Sm.—Thallus determinate, greyish-brown, minutely squamulose-areolate, the areolæ minute, appressed, mostly dispersed on a dense black hypothallus. Apothecia black, small, adnate, plane, marginate; hypothecium colourless; paraphyses slender not well discrete, the apices clavate-capitate, brownish-black; spores ellipsoid, greenish or dark-brown, the large guttulæ of the cells sometimes connected by a tube, about

13-18 μ long, 7-9 μ thick; hymenial gelatine blue then dark-violet, the asci wine-yellow, with iodine.—*Lecidea interpolata* Stirton in Scott. Nat. iv. 165 (1877); Leight. Lich. Fl. ed. 3, 326.

The predominating hypothallus gives a very dark aspect to the plant.

Hab. On rocks.—*B. M.* Near Garve, Ross-shire.

(b) *Hypothecium brown or blackish.*

8. *B. biloculata* A. L. Sm.—Thallus in patches, effuse, silvery-white. Apothecia black, adnate, small, marginate; hypothecium brown; paraphyses clavate and brown at the apices; spores ellipsoid-fusiform, brown, the two cells connected by a tube, 15-18 μ long, 8 μ thick (described by Nylander as placodiomorph); hymenial gelatine deep blue with iodine.—*Lecidea biloculata* Nyl. in Flora lx. 460 (1877); Cromb. in Grevillea vi. 113. Specimen not seen.

Nylander in Flora 1878, 248, seems to have placed the above species under *Lecanora biloculata*, quoted as such by Crombie Monogr. Brit. Lich. i. 383 (1894). With it both authors have united Leighton's *Lecidea polospora*, which has larger spores and grows on hawthorn: otherwise the two seem to be identical, but more specimens are necessary for further examination.

Hab. On bark of holly. Collected by Larbalestier near Kylemore, Connemara, Galway.

9. *B. polospora* A. L. Sm.—Thallus white or glaucous-white, thin, filmy, effuse and somewhat shining, unequal or wrinkled (K —, CaCl —). Apothecia minute, black, plane, with a narrow, slightly prominent margin becoming somewhat convex and immarginate; hypothecium blackish-brown; paraphyses distinct, thickish, globular and blackish-brown at the apices; spores light-to dark-brown, ellipsoid, 1-septate, the paler brown, roundish cells connected by a tube 20-22 μ long, 9 μ thick; hymenial gelatine deep blue with iodine.—*Lecidea polospora* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 241, t. 33, figs. 4-6 (1878), & Lich. Fl. ed. 3, 313. Specimen at Kew examined.

Distinguished by the peculiar spores, which are described by Leighton as polaribilocular. It has not been possible to find spores on our specimen.

Hab. On hawthorn.—*B. M.* Ballynahinch, Galway.

10. *B. myriocarpa* Mudd Man. 217 (1861) (incl. var. *punctiformis*) (? De Not. in Giorn. Bot. Ital. Ann. 2, I. i. 198 (1846)).—Thallus effuse, greenish-grey or blackish, unequal, granular or pulverulent (K —, CaCl —), sometimes evanescent. Apothecia minute, plane or convex, with a thin disappearing margin; hypothecium blackish-brown; paraphyses discrete, clavate or capitate and

dark-brown at the extreme tips: spores oblong, dark-brown, rarely constricted, epispore distinct, 9–16 μ long, 4–8 μ thick; hymenial gelatine deep blue with iodine.—*Patellaria myriocarpa* DC. Fl. Fr. ii. 346 (1805). *Lichen graniformis* With. Arr. ed. 3, iv. 7 (1796) fide Croub. in Grevillea xii. 57 (1883) (non Hagen). *Verrucaria punctata* var. *punctiformis* Hoffm. Deutschl. Fl. ii. 193 (1795). *L. pinicola* Ach. Prod. Lich. Suec. 66 (1798)? Engl. Bot. t. 1851, fig. 1 (1808). *Lecidea pinicola* Borr. ex Hook. in Sm. Engl. Bot. v. 176 (1833). *L. myriocarpa* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 387 (1856); Croub. Lich. Brit. 88; Leight. Lich. Fl. 307; ed. 3, 319; f. *pinicola* Leight. l. c.

Esicc. Bohl. n. 102, Carroll Lich. Hib. n. 20; Mudd nos. 189, 190; Leight. nos. 63 (*L. pinicola*), 181; Larb. Lich. Hb. nos. 32, 33 (f. *saprophila*), 34, 69 (f. *leprosa*), 147, 229, 266, 343, 344; Johns. nos. 358, 359 (f. *pinicola*), 389, 390 (f. *leprosa*).

Externally resembling *Lecidea parasema*, but with usually smaller apothecia, a character specially emphasized in var. *punctiformis* Mudd. Spermatogones are somewhat frequent, the spermatia cylindrical, curved or undulated, 18–23 μ long, 1 μ thick. The thallus varies from being thin and almost obsolete to more or less granular or pulverulent, and these variations have been described in a number of forms by Leighton. In Lich. Fl. ed. 3, 319, he records two forms with an evanescent thallus, f. *quercicola* found on oaks, and f. *saprophila* (non *Lecidea parasema* var. *saprophila* Ach.) on decaying wood, with somewhat larger apothecia. Among saxicolous forms he distinguishes f. *areolata* (in Grevillea v. 84 (1876) and Lich. Fl. ed. 3, 320), characterized by the minutely cracked-areolate thallus; f. *leprosa* (l. c.), in which the greyish thallus has become entirely pulverulent; also f. *ecrustacea* and f. *opegraphina* without any visible thallus, the latter further characterized by the apothecia being more or less clustered in lines. *B. vernicoma* Tuckerm. Gen. Lich. 187 (1872) (*Lecidea vernicoma* Leight. Lich. Fl. ed. 3, 321) has been recorded by Larbalestier from Jersey, but the specimens seen by Leighton, and those in the British Museum, including Larb. Lich. Hb. n. 34, do not agree with the description of Tuckerman's species; they are mostly saxicolous forms of *B. myriocarpa*, but one of the specimens is *Biatorina lenticularis*, the form of the paraphyses in both these species being very similar.

Hab. On trees, palings and rocks.—*Distr.* Frequent throughout the British Isles.—*B. M. Lignicolous*: Jersey; Lustleigh, Devon; Lyndhurst and near Menstrie, New Forest, Hants; St. Leonards, Chilton and Shermanbury, Sussex; Penshurst, Kent; Shere and Richmond Park, Surrey; Hammersmith and Hampstead Heath, Middlesex; Windsor Great Park, Berks; near Cirencester, Gloucestershire; Lewknor and Wheatfield, Oxfordshire; High Beach, Epping Forest, Walthamstow, Hockley Woods, Uting, Stansted Mount Fitchet, Broomfield and Hatfield Peverel, Essex; Babraham and Gamlingay (f. *saprophila*), Cambridgeshire; near Tuddenham, Suffolk; Thetford Warren and near King's Lynn, Norfolk; near Pixham Ferry, Worcestershire; Polesworth and Leamington, Warwickshire; near Shrewsbury, Battlefield, Church Stretton, Haughmond Hill and Newport, Shropshire; Elmhurst, Staffordshire; Twycross, Leicestershire; Barmouth and Dolgelly, Merioneth; Bettws-y-Coed, Carnarvon-

shire; near Stokesley, Cleveland, Yorkshire; Teesdale, Durham; Orton and Casterton, Westmorland; Keswick and Ennerdale, Cumberland; Killin and Aberfeldy, Perthshire; Loch Lomond, Dumbartonshire; Appin, Argyll; Mar Forest, Braemar and Countesswells, near Aberdeen; Applecross, Ross-shire; Riverstown, Glanmire and Blarney, Cork; Tore Mt., Killarney; Ballynagarde, Limerick; Killaloe and Kilkee, Clare; near Belfast, Antrim. **Saxicolous**: Fliquet Bay and La Moye, Jersey; Lewes, Sussex; Shere, Surrey; Goodwick Bay, Pembrokeshire; Charnwood Forest, Leicestershire; Hale End, Malvern, Worcestershire; Lyth Hill, Shropshire; Cliffrigg, Cleveland, Yorkshire; Portlethen, Kincardineshire; Countesswells Woods near Aberdeen (on *Baomyces rufus*); Inniscarra and Kilcully, Cork; Kilkee, Clare; Mweelen, Kylemore, near Salrock and near Lough Feagh, Connemara, Galway; Lambay, Dublin.

Var. *chloropolia* Th. Fr. Lich. Scand. 595 (1874).—Thallus thicker than in the species, greenish-grey, unequal, granular.—*Lecidea chloropolia* Fr. Summa 115 (1846) nomen. *L. myriocarpa* f. *chloropolia* Leight. Lich. Fl. ed. 3, 319 (1879). *Lichen pinicola* Sm. Engl. Bot. t. 1851, fig. 2 (1808).

Exsicc. Bohl. n. 124 (as *Lecidea pinicola*) Larb. Lich. Hb. n. 31, and Lich. Cantab. n. 34.

Scarcely to be distinguished from some forms of the species. The apothecia are occasionally somewhat larger, and are comparable to Leighton's f. *saprophila*.

Hab. On decorticated trunks and old palings.—*Distr.* Somewhat rare in the Channel Islands, S., Central and N. England.—*B. M.* Beaufort, Jersey; near Bovey Tracey, Devon; Lyndhurst, New Forest, Hants; Finchley, Middlesex; Walthamstow, Essex; near Cambridge; near Knighton, Leicestershire; Levens, Westmorland.

11. *B. Schæreri* De Not. in Giorn. Bot. Ital. Ann. 2. I. i. 199 (1846).—Thallus effuse, thin, whitish, minutely granular or pulverulent, sometimes evanescent (K —, CaCl —). Apothecia minute, black, plane or subconvex, the margin thin, disappearing; hypothecium brownish or dark-brown; paraphyses concrete dark-brown at the tips; spores oblong or oblong-ellipsoid, pale-greenish-brown, small, 6-10 μ long, 2-4 μ thick.—*B. nigrītula* Mudd Man. 217 (1861). *Lecidea nigrītula* Nyl. in Bot. Not. 1853, 99; Cromb. Lich. Brit. 89; Leight. Lich. Fl. 307; ed. 3, 321.

Closely resembling some forms of the preceding, but differing in the small size and paler colour of the spores.

Hab. On trunks of trees and on wood.—*Distr.* Rare in S., Central and N. England and Scotland. — *B. M.* New Forest, Hants; Trefriw, Carnarvonshire; Farndale, Yorkshire; Levens Park, Kendal, Westmorland; Craig Calliaoch, Perthshire.

12. *B. præcavenda* A. L. Sm.—Thallus effuse, very thin, blackish-green, scarcely visible (K —, CaCl —). Apothecia subminute, plane or slightly concave, thinly margined, reddish-

brown or black; paraphyses slender, conglutinate, dark-amber-brown at the tips, forming a reddish-brown epithecium; hypothecium (especially above) reddish-brown; spores ellipsoid, reddish-brown, 14–17 μ long, 6–8 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea præcavenda* Nyl. in Flora lii. 411 (1869); Cromb. in Journ. Bot. vii. 232 (1869) & Lich. Brit. 88; Leight. Lich. Fl. 309; ed. 3, 323.

Distinguished by the biatorine character of the apothecia and by the reddish colour internally. In the single specimen gathered, the thallus and apothecia are sparingly present, and are interspersed with a sphaeriaceous fungus.

Hab. On a decaying holly.—*B. M.* Near Lyndhurst, New Forest, Hants.

13. *B. æthalea* Th. Fr. Lich. Scand. 604 (1874).—Thallus effuse, thin or thickish, minutely cracked-areolate, greyish or brownish-grey (K + yellow then red, CaCl —); hypothallus black. Apothecia minute, innate, concave or almost plane, with a thin prominent margin; hypothecium brownish or dark-brown; paraphyses coherent, dark-brown at the apices; spores ellipsoid, usually constricted at the septum, dark-brown, 10–15 μ long, 6–8 μ thick; hymenial gelatine deep blue with iodine.—*B. badioatra* var. *atroalbella* Mudd Man. 214 (1861). *Gyalecta æthalea* Ach. Lich. Univ. 669 (1810). *Lecidea atroalba* var. *atroalbella* Nyl. Obs. Syn. Lich. Holm. 6 (1853). *L. atroalbella* Leight. Lich. Fl. 310 (1871); ed. 3, 324. *L. æthalea* Stiz. in Jahresber. St. Gall. Nat. Ges. 456 (1882); Cromb. in Journ. Bot. xx. 275 (1882).

Exsicc. Mudd n. 185 (as *B. coracina*); Leight. n. 184 (as *Lecidea atroalba* var. *atroalbella*); Johns. n. 510.

The thallus is typically very thin, the areolæ being contiguous or dispersed on a black hypothallus; when more developed the areolæ are more compact and deeply cracked.

Hab. On quartzose and schistose rocks.—*Distr.* Rather rare in maritime and upland districts.—*B. M.* Shanklin, I. of Wight; Lyth Hill and near Church Stretton, Shropshire; Easby, Lonsdale and Battersby, Cleveland, Yorkshire; Warton Crag, Lancashire; Staveley, Westmorland; Barrowmouth, Cumberland; I. of Lismore, Barmaldine, Appin, and Saddell, Carradale, Argyll; Lough Feagh, Connemara, Galway; Achill Island, Mayo.

14. *B. succedens* A. L. Sm.—Thallus effuse, thin, granulate, unequal, or subareolate, whitish. Apothecia submoderate, margined, brownish-black; paraphyses moderate, jointed, thickened and brownish at the apices; hypothecium brown or reddish-brown; spores ellipsoid, simple or 1-septate, blackish, 11–14 μ long, 4.5–5.5 μ thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea succedens* Nyl. in Flora xlix. 372 (1866); Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. 332 (1867) & Lich.

Fl. 308; ed. 3, 322; Carroll in Journ. Bot. v. 258 (1867); Cromb. Lich. Brit. 89. Specimen not seen.

Closely allied with *L. secedens* Nyl., a corticolous species of N.W. France.

Hab. On a mica-schist rock on one of the S. Grampians (Ben Lawers, Perthshire).

15. *B. verruculosa* Mudd Man. 215 (1861) (excl. var. *spuria*).—Thallus effuse, minutely cracked-areolate, the areolæ scattered or contiguous, plane or slightly convex, smooth, yellowish-green (K —, CaCl + orange-red, medulla I —); hypothallus blackish, often little visible. Apothecia black, minute, innate, almost plane, thinly margined, becoming convex and immarginate; hypothecium dull-brown; paraphyses coherent, brown at the clavate apices; spores oblong, sometimes slightly constricted at the septum, brown, 12–16 μ long, 6–9 μ thick; hymenial gelatine deep-blue with iodine.—*B. ocellata* Koerb. Syst. Lich. Germ. 224 (1855). *Lichen verruculosus* Borr. in Engl. Bot. t. 2317 (1812). *Lecidea verruculosa* Borr. ex Hook. in Sm. Engl. Fl. v. 174 (1833); Leight. Lich. Fl. 303; ed. 3, 315. *L. ocellata* Floerke ex Flot. in Flora xi. 691 (1828); Cromb. in Journ. Bot. vii. 108 (1869) & Lich. Brit. 93. *L. kaleida* Tayl. in Lond. Journ. Bot. vi. 150 (1847). *L. lecanorina* Salw. in Trans. Bot. Soc. Edin. vii. 552 (1863)?.

Exsicc. Mudd n. 186.

Differs from *B. spuria* in the colour of the thallus and in the larger spores. The hypothecium in both these species is brown in thick section, but paler in thin section. The areolæ are occasionally sub-squamulose.

Hab. On rocks and flints.—*Distr.* Somewhat rare in maritime and upland regions. —*B. M.* Lydd Beach, Kent; Carlton Bank, Cleveland, Yorkshire; Muggleswick Hill, Durham; Staveley, Westmorland; Lamplugh, Cumberland; Craig Tulloch, Blair Athole, Perthshire; near Cork; Blackwater Bridge, Lough Caragh and Dunkerron, Kerry.

Subsp. *præponens* A. L. Sm.—Thallus determinate, warted-areolate or thinly granular, yellowish-green. Apothecia small, subinnate, uneven, immarginate; spores 15–17 μ long, 8–10 μ thick.—*Lecidea ocellata* subsp. *præponens* Nyl. in Flora li. 347 (1868); Cromb. in Journ. Bot. vii. 108 (1869) & Lich. Brit. 94. *L. verruculosa* var. *præponens* Leight. Lich. Fl. 304; ed 3, 316.

Hab. On rocks in maritime regions.—*B. M.* Portlethen and near Cove and Nigg, Kincardineshire (the only localities).

16. *B. saxatilis* Koerb. Syst. Lich. Germ. 228 (1855).—Thallus thickish, unequal, cracked, faintly yellowish-white or greyish (K —, CaCl —). Apothecia black, minute, scattered, innate, then sessile, plane, the margin entire, sometimes prominent; hypothecium blackish-brown; paraphyses subcoherent,

capitate and blackish-brown at the apices; spores ellipsoid, dark-brown, 9–14 μ long, 4–6 μ thick; hymenial gelatine blue, the asci wine-red but blue at the tips, with iodine.—Mudd Man. 216. *Calicium saxatile* Schær. in Meisner's Nat. Anz. no. 5, 1821, 35 & Enum. 166. *Lecidea saxatilis* Hepp Flecht. Eur. n. 145 (1853); Cromb. Lich. Brit. 89; Leight. Lich. Fl. 303; ed. 3, 315.

Approaching *B. verruculosa*, but distinguished by the unequal thicker thallus, and by the more prominent apothecia. See also note on *Rinodina aequata* Monogr. i. 254 (1918).

Hab. On rocks.—*Distr.* Rare in maritime and upland districts in Wales, E. Scotland and in N. and W. Ireland.—*B. M.* Nigg, Kincardineshire.

17. *B. ryssolea* A. L. Sm.—Thallus whitish-grey, thick, tartareous, cracked-areolate, the areolæ plane or somewhat convex, irregularly wrinkled (K + yellow, then red), limited by the black hypothallus. Apothecia numerous, rather large, prominent, blackish-brown, rusty, with a thick, paler margin; hypothecium thick, blackish-brown; paraphyses indistinct, thickened and blackish-brown at the apices; spores dark-brown, 16–17 μ long, 7–8 μ thick; hymenial gelatine pale-dirty-blue with iodine.—*Lecidea ryssolea* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 237 (1878) & in Lich. Fl. ed. 3, 324.

Hab. On sandstone rocks.—*Distr.* Rare in S.W. Wales (Fort Hill near Fishguard, Pembrokeshire) and E. Ireland.—*B. M.* Howth near Dublin (M. C. Knowles).

18. *B. saxorum* Massal. Ric. Lich. 82 (1852).—Thallus thin, minutely cracked-areolate, plane, dirty-yellowish-white (K + yellow), limited by the black hypothallus. Apothecia numerous, scattered, sessile, plane, black, the margin thick, rather paler; hypothecium black or blackish-brown; paraphyses slender, capitate, the epithecium dull-brown; spores ellipsoid or subovoid, 13–17 μ long, 6–8 μ thick; hymenial gelatine blue then yellowish-brown with iodine.—*Lecidea saxorum* Hepp Flecht. Eur. n. 752 (1867); Leight. Lich. Fl. 302; ed. 3, 314.

Differs from *B. leptocline* in the very marked limiting hypothallus; from *B. subdisciformis* in the reaction with potash.

Hab. On rocks.—*Distr.* Rare in the Channel Islands and N. England.—*B. M.* Skegges Water, Westmorland.

19. *B. excelsa* A. L. Sm.—Thallus white, thin, effuse, areolate cracked, the areolæ plane and flat, somewhat shining, at times scattered or almost obsolete (Kf + yellow, CaClf + yellow). Apothecia black or violet-black, small, innate, plane or somewhat concave, the margin thickish, prominent; hypothecium blackish-brown; paraphyses indistinct, blackish-brown and thicker at the

apices; spores dark-brown, oblong, $15\ \mu$ long, $7\ \mu$ thick.—*Lecidea excelsa* Leight. in Grevillea iv. 78 (1876) & Lich. Fl. ed. 3, 323.

Hab. On mica-schist rocks.—*B. M.* Summit of the Doughruagh Mt., Connemara, Galway.

20. *B. leptocline* Koerb. Syst. Lich. Germ. 225 (1855) (excl. syn. *B. saxorum*).—Thallus whitish or greyish-white, warted- or cracked-areolate (Kf + yellow, I + blue); hypothallus indistinct. Apothecia sessile or adnate, rather large, plane or becoming convex, the margin prominent then excluded; hypothecium blackish-brown; paraphyses coherent, dark-brown at the capitate tips; spores ellipsoid, blackish-brown, $12\text{--}16\ \mu$ long, $6\text{--}9\ \mu$ thick; hymenial gelatine deep-blue with iodine.—*Lecidea leptocline* Flot. in Bot. Zeit. viii. 555 (1850).

Hab. On rocks in northern or alpine regions.—*B. M.* Foot of Ben Lawers, Perthshire.

Var. *Mougeotii* Th. Fr. Lich. Scand. 598 (1874).—Thallus whitish, granular-dispersed or evanescent. Apothecia prominent, small, black, not pruinose; spores $11\text{--}16\ \mu$ long, $6\text{--}8\ \mu$ thick.—*Lecidea Mougeotii* Hepp Flecht. Eur. n. 311 (1857). *L. hypopodioides* Nyl. in Flora l. 372 (1867).

Hab. On rocks in mountainous regions.—*B. M.* Craig Tulloch, Blair Athole, Perthshire.

Var. *gevensis* Th. Fr. l. c.—Apothecia often angular and crenate, more or less pruinose with an æruginous, green powder, the margin black, naked, otherwise as in the species.—*Buellia gevensis* Th. Fr. in Bot. Not. 1865, 111. *Lecidea gevensis* Cromb. var. *prolata* Nyl. ex Cromb. in Grevillea i. 173 (1873). Specimen not seen.

Hab. On rocks. Found by Crombie on Cairn Gowar, Blair Athole, Perthshire.

21. *B. leptoclinoides* Steiner in Verh. K. K. Zool.-Bot. Ges. Wien lvii. 357 (1907).—Thallus thin, greyish, cracked-areolate, the areolæ plane or slightly turgid (K + yellow, CaCl —). Apothecia black, concave then plane, with a thickish margin; hypothecium reddish-brown; paraphyses slender, lax, faintly septate, brown at the capitate tips; spores ellipsoid or ovoid, straight or curved, $10\text{--}15\ \mu$ long, $6\text{--}9\ \mu$ thick.—*Lecidea leptoclinoides* Nyl. in Bull. Soc. Linn. Norm. sér. 2, vi. 311 (1872).

Hab. On rocks.—*Distr.* Rare in the Channel Islands (Jersey, collected by Larbalestier, *vide* Steiner).

22. *B. stellulata* Mudd Man. 216 (1861).—Thallus suborbicular, thin, minutely cracked-areolate, the areolæ plane, smooth, white or greyish-white (K + yellow, CaCl —, medulla I —); hypo-

thallus thin, black. Apothecia minute, subinnate, crowded, plane, black, margined, the margin thin, entire; hypothecium brownish-black; paraphyses coherent, brownish-black at the apices; spores ellipsoid, 9–12 μ long, 4–5 μ thick; hymenial gelatine bluish with iodine.—*Lecidea stellulata* Tayl. in Mackay Fl. Hib. ii. 118 (1836); Carroll in Nat. Hist. Rev. 1859, 528; Cromb. Lich. Brit. 86; Leight. Lich. Fl. 304; ed. 3, 316.

Exsicc. Leight. n. 276; Larb. Cæsar. n. 38 & Lich. Hb. n. 311.

In a less developed condition the thallus, as noticed by Taylor, occurs in small patches usually less than an inch in diameter; but these afterwards become confluent, the thallus eventually attaining a diameter of 4 inches or more. The areolæ, aggregate in the perfect plant, are at times somewhat scattered (form *dispersa* Leight. Lich. Fl. ed. 3, 316). The numerous apothecia are crowded, and here and there confluent (form *confluens* Leight. l. c.), when the margin is obliterated.

Hab. On rocks and stones in maritime, rarely in mountainous districts.—*Distr.* Not unfrequent in the Channel Islands, S. and W. England, S. and N.E. Ireland; very rare in the S.W. Highlands of Scotland.—*B. M.* Portelet Bay and La Moye, Jersey; Cobo Bay, Guernsey; Sark; Alderney; Whitesand Bay, St. Merryn and Kynezal Cliff, near Penzance, Cornwall; Torquay, Devon; Lydd Beach, Kent; Hastings, Aldrington Beach and near Brighton, Sussex; Shanklin, I. of Wight; Fort Hill, Fishguard, Pembrokeshire; Dolgelly and Barmouth, Merioneth; Borth, Cardiganshire; Gimlet Rock, Pwllheli and Capel Curig, Carnarvonshire; I. of Man; Barcaldine, Argyll; Kinsale, Cork; Killarney, Kerry; Carrigogunnel, Limerick; Salrock, Kylesmore, Galway; near Ardglass, Down.

23. *B. impressula* A. L. Sm.—Thallus whitish-grey, thin, filmy, areolate (K + yellow then red), limited by the black hypothallus. Apothecia black, minute, numerous and crowded into small groups of three or more, impressed in the thallus, each apothecium circumscribed so as to appear surrounded by a thin thalline margin; hypothecium thin, blackish-brown; paraphyses indistinct, the hymenium tinged with brown; spores roundish-oblong, more or less constricted in the middle, brown, 14–15 μ long, 9 μ thick; hymenial gelatine dull-blue with iodine.—*Lecidea impressula* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 237, t. 32, figs. 1 & 2 (1878) & Lich. Fl. ed. 3, 324.

Not unlike *B. æthalea* in thallus and spores, but considered by Leighton to be allied to the preceding, from which it differs in the appearance of the apothecia and in the larger spores. By the contiguous growth of several plants on the same stone, the surface becomes intersected by dark lines.

Hab. On bluish-grey slates.—*Distr.* Rare in hilly regions in Wales and N. England.—*B. M.* Abergwesyn, Breconshire; Bangor, Cardigan-shire; Millbeck, Keswick and Skiddaw, Cumberland.

24. *B. subdisciformis* Jatta Syll. Lich. Ital. 392 (1900).—Thallus determinate, thickish, minutely cracked-areolate, the

areolæ plane, sordid-yellowish-white (K + yellow then red, CaCl —, medulla I —); hypothallus black, limiting the thallus. Apothecia sessile, plane, marginate, blackish, more or less pruinose, the margin thick, entire, paler; hypothecium black; paraphyses discrete; hymenium pale-brown; spores oblong, brown, 11–16 μ long, 7–8 μ thick.—*Lecidea subdisciformis* Leight. Lich. Fl. 308 (1871); ed. 3, 322.

Exsicc. Larb. Lich. Cæsar. n. 35.

Distinguished from allied species by the strongly marked hypothallus which occasionally intersects the thallus, and by the chemical reaction.

Hab. On rocks.—*Distr.* Somewhat rare in the Channel Islands, S. and Central England, Wales and N. and W. Ireland.—*B. M.* Jersey, Guernsey; Noirmont, Jersey; Sark; Lamorna, Cornwall; Torquay, Devon; North Hill, Malvern, Worcestershire; Conway, Carnarvonshire; Kinsale, Cork.

Var. *meiosperma* Steiner in Verh. K. K. Zool.-Bot. Ges. Wien lvii. 363 (1907).—Thallus as in the species. Apothecia often bluish-grey pruinose; spores smaller, 9–12 μ long, 5–7 μ thick.—*Lecidea disciformis* var. *meiosperma* Nyl. in Flora li. 478 (1868); Cromb. Lich. Brit. 88. *L. subdisciformis* var. *meiosperma* Leight. Lich. Fl. 308 (1871); ed. 3, 322.

Hab. On rocks.—*Distr.* Rare in the Channel Islands.—*B. M.* Jersey; the Eperquerie, Sark.

25. *B. disciformis* Mudd Man. 216 (1861) pro parte.—Thallus determinate, thin, smooth, continuous, unequal or cracked-areolate, whitish or greyish-white (K + yellow, CaCl —); hypothallus thin, black, limiting the thallus. Apothecia sessile, moderate or somewhat small, plane and thinly margined, at length convex and almost immarginate, black; hypothecium dark-brown or black; paraphyses subconcrete, brownish at the apices, branched and capitate; spores ellipsoid or oblong, 19–30 μ long, 8–14 μ thick; hymenial gelatine bluish with iodine.—*Lecidea disciformis* Nyl. in Bot. Not. 1852, 175; Cromb. Lich. Brit. 88; Leight. Lich. Fl. 305; ed. 3, 317. *Lecidea parasema* var. *disciformis* Fr. Nov. Sched. Crit. 9 (1826).

Exsicc. Leight. n. 180; Mudd n. 187; Carroll Lich. Hib. n. 19; Johns. n. 388.

Often confounded by authors with *L. parasema*, from which, among other differences, the character of the spores renders it very distinct. The thallus, at times little visible, is occasionally entirely evanescent (form *ecrustacea* Nyl. in Act. Soc. Linn. Bord. sér. 3. i. 387 (1856)). The apothecia are numerous, but usually somewhat scattered. The minute black spermatogones, which are not unfrequent, have slender straight spermatia 4–5 μ long, 1 μ thick.

Hab. On the smooth bark, very rarely on denudate trunks of trees in upland districts.—*Distr.* General and not uncommon in Great

Britain, rarer in S. Ireland, not seen from the Channel Islands.—*B. M.* Sevenoaks, Kent; St. Leonards Forest, Sussex; near Lyndhurst, New Forest, Hants; Ullacombe, Bovey Tracey, S. Devon; Launceston, Cornwall; Shere, Surrey; Nannau and Garth, Dolgelly, Merioneth; Bettws-y-Coed, Carnarvonshire; Llanforda and Haughmond Hill, Shropshire; Kildale and Newton Wood, Cleveland, Yorkshire; Egglestone, Durham; Windermere, and Levens Park, Westmorland; Calder Abbey, Cumberland; Barcaldine, Argyll; Kenmore, Killin, Glen Lochay, Glen Falloch and Aberfeldy, Perthshire; Banchory Devenick near Aberdeen, and Castleton of Braemar, Aberdeenshire; Lairg, Sutherlandshire; Applecross, Ross-shire; Glenbower Wood and Old Deer Park, Castle Martyr, Cork; Muckcross and Cloghan, Killarney, Glencar, Blackwater Bridge, and Old Dromore, Kerry.

Var. *saxicola* Oliv. Exp. Syst. Lich. ii. 2, 145 (1901).—Thallus tartareous, smooth, unequal, cracked-areolate, the areolæ contiguous, whitish or greyish (K + yellow then red); apothecia numerous, becoming convex and immarginate, sometimes 2- or 3-aggregate, somewhat scabrid: hypothecium reddish- or blackish-brown; paraphyses discrete, brown at the tips, branched and capitate; spores ellipsoid, 18–22 μ long, 9–11 μ thick.

Agreeing with the species in the general characters but differing in the somewhat thicker thallus, the smaller spores, and the saxicolous habitat. It differs also in the reaction with potash.

Hab. On rocks.—*B. M.* Boulay Bay, Jersey; near Land's End, Cornwall; Kircubbin, Down.

Var. *insignis* A. L. Sm.—Thallus effuse, thin, warted-granular, whitish (K + y). Apothecia rather large, usually plane; spores large, 18–32 μ long, 11–16 μ thick, otherwise as in the species.—*Buellia insignis* var. *corticicola* Koerb. Syst. Lich. Germ. 230 (1855); Leight. in Grevillea i. 134 (1873). *Lecidea insignis* var. *muscorum* Næg. in Hepp Flecht. Eur. n. 40 (1853); f. *corticicola* Leight. Lich. Fl. ed. 3, 314; *L. disciformis* subsp. *insignis* Nyl. ex Norrl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. x. 340 (1873).

Differs from the species in the habitat and in the generally larger spores. Leighton (*ll. c.*) records only the f. *corticicola* (Koerb. *l. c.*) collected at Bomere Pool, Shropshire, which perhaps belongs to the species.

Hab. Incrusting mosses on the ground in an alpine situation.—*B. M.* Summit of Ben Lawers, Perthshire.

Var. *triphragmia* Boist. Nouv. Fl. Lich. pt. 2, 234 (1902).—Thallus and apothecia similar to the species; spores 3-septate, 24–34 μ long, 9–11 μ thick.—*Lecidea triphragmia* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 387 (1856); Cromb. in Journ. Bot. ix. 179 (1871); Leight. Lich. Fl. 329; ed. 3, 349.

Similar to the species, but with 3-septate spores mixed with the 1-septate.

Hab. On shady rocks.—*B. M.* Morrone, Braemar, Aberdeenshire.

26. *B. hyperiza* A. L. Sm.—Thallus greyish or blackish-grey, thin, smooth, continuous, obscurely limited (K —, CaCl —). Apothecia black, plane or slightly convex, rather large, margin obtuse; hypothecium dark-brownish, grumous; paraphyses distinct, slender, often septate, branched above; spores dark-brown, ellipsoid, sometimes 3-4-nucleate, rather large, 16–22 μ long, 9–12 μ thick; hymenial gelatine intensely-blue with iodine.—*Lecidea hyperiza* Stirton in Grevillea iii. 35 (1874); Leight. Lich. Fl. ed. 3, 323 (1879) (sphalm. *hyperiza*).

Hab. On smooth bark of trees. Collected by Dr. Stirton near Killin, Perth.

27. *B. conioops* Th. Fr. Lich. Arct. 231 (1860).—Thallus determinate, warted-granulose, unequal, moderate, greyish-brown or greyish-ferruginous, the granules small, crenate, at length conglomerate (K —, CaCl —); hypothallus blackish, often limiting the thallus. Apothecia subminute, plane, adnate-appressed, black or brownish-black, margined, the margin prominent, thin, entire; hypothecium brown; paraphyses coherent, brown at the thickened apices; spores ellipsoid, obtuse, slightly constricted in the middle, blackish-brown, 12–17 μ long, 8–9 μ thick; hymenial gelatine deep-blue with iodine.—*Lecidea conioops* Wahlenb. in Ach. Meth. Suppl. 8 (1803); Cromb. Lich. Brit. 88; Leight. Lich. Fl. 306; ed. 3, 318.

Exsicc. Larb. Lich. Hb. n. 344 (as *Lecidea myriocarpa* var. *alepta*).

Often confounded by authors with *Lecidea latypha*. It at first forms small circular patches on the substratum, limited by a radiating hypothallus, which subsequently become confluent, with the hypothallus evanescent. The British specimens gathered are well fertile.

Hab. On schistose rocks in maritime or upland districts.—*B. M.* Charnwood Forest, Leicestershire; near Cove, Kincardineshire; Clare Island, Mayo.

28. *B. atrata* Mudd Man. 215 (1861).—Thallus greyish or usually greyish-black, rather thick, cracked-areolate, the areolæ small, smooth, plane or convex (K + yellow then red); hypothallus black. Apothecia black, innate or appressed, becoming superficial, plane or convex, the margin thin, entire, disappearing; hypothecium thick, dark-brown; paraphyses somewhat lax, dark-bluish-green or almost black at the apices; spores dark-brown, ellipsoid, 11–17 μ long, 6–10 μ thick; hymenial gelatine deep-blue with iodine.—*B. coracina* Koerb. Syst. Lich. Germ. 224 (1855); Mudd Man. 214. *Verrucaria coracina* Hoffm. Deutschl. Fl. ii. 183 (1795)? *Lichen atratus* Sm. Engl. Bot. t. 2335 (1811). *Lecidea atrata* Hook. in Sm. Engl. Fl. 174 (1833) (non Ach. *vide* Th. Fr. Lich. Scand. 607). *L. coracina* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 372 (1856) (non Ach. vel pro minore parte, *vide* Th.

Fr. Lich. Scand. 607); Cromb. Lich. Brit. 86; Leight. Lich. Fl. 307; ed. 3, 321.

Exsicc. Cromb. n. 92.

Easily recognized by the very dark colour of the thallus and apothecia. The specimens collected by Mudd and named by him *B. coracina* are included under *B. æthalea*. They have a lighter-coloured thallus and light-brown hypothecium. Hoffmann's plant is doubtful; he cites as a synonym Dickson's *Lichen atrocinerus*, which is a species of *Rinodina*.

Hab. On rocks.—*Distr.* Somewhat rare in subalpine districts of England, Scotland and Ireland.—*B. M.* Canlochan, Forfarshire; Morrone, Braemar, Aberdeenshire; Glen Spean, Inverness-shire.

Var. *brunnea* A. L. Sm. Monogr. ii. 179 (1911).—Thallus formed of small brownish areolæ contiguous or somewhat scattered on a black, predominant, radiating hypothallus (K —, CaCl —). Apothecia black, convex, with a thin unequal margin, sometimes several aggregate; hypothecium thick, black; paraphyses easily separating from the hypothecium and brownish at the base, subdiscrete, clavate and dark-greenish-blue or almost black at the tips; spores rounded-oblong, becoming dark-brown, 12–15 μ long, 8 μ thick; hymenial gelatine deep-blue with iodine.

Outwardly resembling *Lecidea atrobrunnea* Schær., a continental species. It differs from the species in the lighter, more dispersed thallus and in the absence of any thalline reaction.

Hab. On a granitic boulder.—*B. M.* Summit of Craig Calliach, Perthshire.

29. *B. scabrosa* Koerb. Syst. Lich. Germ. 227 (1855).—Thallus determinate, appressed, thin, areolate or areolate-granular, citrine or yellow-greenish (K + yellow, CaCl —); hypothallus obsolete. Apothecia small, appressed, somewhat convex, at length immarginate, black, slightly scabrid; hypothecium black; paraphyses slender, conglutinate, dull-greenish in the mass, the epithecium black; spores ellipsoid, brown, 12–18 μ long, 6–8 μ thick; hymenial gelatine tawny-wine-red with iodine.—*Lecidea scabrosa* Ach. Meth. 48 (1803); S. F. Gray Nat. Arr. i. 466 pro parte; Hook. in Sm. Engl. Fl. v. 178; Tayl. in Mackay Fl. Hib. ii. 122; Cromb. Lich. Brit. 93; Leight. Lich. Fl. 304; ed. 3, 316; *Lichen scabrosus* Sm. Engl. Bot. t. 1878 (1808).

Exsicc. Larb. Lich. Hb. n. 146.

Has much the general aspect of more developed states of *Bacidia flavovirescens*, of which it was subsequently regarded by Acharius as a variety. Apart, however, from other characters, it differs in the anatomical structure of the apothecia. In the British specimens the thallus usually forms small orbicular patches. The apothecia are numerous, often aggregate and confluent, arranged as it were in circles.

Hab. On the ground, rarely encrusting mosses on rocks in mountainous districts, generally associated with *Bæomyces rufus*.—*Distr.*

Very local and scarce on the Grampians, Scotland, and in W. Ireland.—*B. M.* Ben Lawers, Craig Tulloch, and Rannoch, Perthshire; Canlochan, Forfarshire; Morrone, Braemar, Aberdeenshire; near Kylemore, Connemara, Galway.

Form *athallina* A. L. Sm.—Thallus absent, otherwise as in the species.—*Lecidea scabrosa* f. *athallina* Nyl. ex Norrl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. x. 341 (1873).

In one of the two British specimens there are traces of the proper thallus, which probably is always normally present, though obliterated, as in other instances, by the more vigorous growth of the host.

Hab. On the thallus of *Baomyces rufus* in mountainous regions.—*Distr.* Rare on the Grampians, Scotland.—*B. M.* Ben Lawers, Perthshire.

30. *B. alpicola* Krempelh. Lich.-Fl. Bay. 201 (1861).—Thallus subdeterminate, thickish, areolate, the areolæ rather large, continuous or somewhat scattered, plane or slightly convex, bright-yellow (K + deep yellow, at length orange-red, CaCl —, medulla I —); hypothallus black, distinct. Apothecia black, appressed, plane and thinly margined, at length often slightly convex, sessile, and immarginate: hypothecium brownish-black; paraphyses concrete, black at the apices, spores ellipsoid, greenish-black, 18–28 μ long, 10–15 μ thick; hymenial gelatine deep-blue with iodine.—*Lecidea alpicola* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 388 (1856); Cromb. in Journ. Bot. viii. 99 (1870) & in Grevillea iii. 143; Leight. Lich. Fl. 315: ed. 3, 328. *L. geographica* var. *alpicola* Schaer. Spicil. 124 (1828) & Enum. 106. *L. atrovirens* var. *alpicola* Wahlenb. Fl. Lapp. 474 (1812) pro parte.

Externally subsimilar to states of *Rhizocarpon geographicum*, with which, at first sight, it might readily be confounded. It differs in the rather larger areolæ and apothecia, and more especially in the 1-septate shorter spores and the thalline reaction with hydrate of potash. Apparently one of our rarer British lichens.

Hab. On quartzose and whinstone rocks and boulders in alpine situations.—*Distr.* Very local and scarce on summits of a few of the Grampians, Scotland.—*B. M.* Ben Lawers and Mael Graedha, Killin, Perthshire; Morrone, Braemar, Aberdeenshire.

31. *B. pulchella* Tuckerm. Gen. Lich. 185 (1872).—Thallus orbicular, thick, wrinkled, roundly lobed at the circumference, citrine-sulphureous or bright-greenish-yellow (K —, CaCl —, medulla I —); hypothallus black. Apothecia moderate, appressed, plane, obtusely margined, at length sessile, convex, immarginate, black, concolorous within; hypothecium thick, black; paraphyses coherent, yellowish-brown or sordid-greenish, dark-brown at the apices; spores ellipsoid, obtuse at the apices, often slightly constricted in the middle, brown, 10–17 μ long, 7–10 μ thick; hymenial gelatine bluish with iodine.—*Lichen pulchellus* Schrad. in Schrad. Journ. Bot. i. 74 (1801). *Psora*

galbula Ramond ex DC. Fl. Fr. ii. 368 (1805). *Lecidea pulchella* Schær. Enum. 100 (1850); Leight. Lich. Fl. ed. 3, 544. *L. galbula* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 388 (1856); Cromb. Lich. Brit. 93.

Well characterized not only by the form of the thallus, but also by its colour, which readily attracts the eye. In age, according to Th. Fries (Lich. Scand. 588), the thallus becomes pulverulent or rimulose. The apothecia are here and there confluent.

Hab. Incrusting decayed mosses on the ground in crevices of boulders in alpine localities.—*Distr.* Extremely local and scarce on one of the N.W. Grampians, Scotland.

32. *B. colludens* Tuckerm. Syn. N. Amer. Lich. pt. 2, 100 (1888).—Thallus effuse or subdeterminate, areolate, the areolæ plane or somewhat convex, scattered or contiguous, greyish-red or brownish-grey, sometimes almost obsolete (K —, CaCl —, I —); hypothallus black. Apothecia rather large, sessile or innate-sessile, plane, black, the margin thickish, entire, or rarely crenulate; hypothecium brownish-black; paraphyses conglomerate, greenish- or brownish-black at the clavate-capitate apices; spores colourless then more or less brown, ellipsoid or somewhat fusiform, with a hyaline epispore, 18–29 μ long, 7–14 μ thick; hymenial gelatine deep-blue with iodine.—*Lecidea colludens* Nyl. in Flora liii. 38 (1870); Cromb. in Journ. Bot. viii. 99 (1870); Leight. Lich. Fl. 314. *L. atroalba* var. *applanata* Fr. Summa, 116 (1846). *L. applanata* Leight. Lich. Fl. ed. 3, 327 (1879) (non Chev.).

Exsicc. Larb. Lich. Hb. n. 355; Johns. n. 391.

The thallus varies in thickness and colour, and is sometimes limited by the hypothallus. The apothecia are numerous, scattered or contiguous, and sometimes slightly umbonate, with the margin usually persistent, though occasionally they are convex and immarginate.

Hab. On schistose and quartzose rocks, usually by streams in upland and subalpine districts.—*Distr.* Rather local in S. and Central England, Wales, on the Grampians, Scotland, and in W. Ireland.—*B. M.* Rough Tor, Cornwall; Bradgate Park, Leicestershire; near Buxton, Derbyshire; near Barmouth, Dolgelly and Cader Idris, Merioneth; Llanwrtyd, Breconshire; near Douglas, Isle of Man; Nan Bield and Mardale, Westmorland; Keswick and Eskdale, Cumberland; Ben Lawers and Craig Calliach, Perthshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; near Kylemore, Connemara, Galway; Clare Island and Achill Island, Mayo.

33. *B. deludens* A. L. Sm.—Thallus determinate thin, firm, cracked, whitish (Kf + yellowish, CaCl —); hypothallus thin, black. Apothecia rather large, plane, innate and circumscribed, obtusely margined, black; hypothecium brown; paraphyses subdiscrete, regular, brown or violet-brown at the clavate apices, the epithecium blackish (K + purplish); spores ellipsoid dark-brown, with a hyaline epispore, 22–27 μ long, 8–13 μ thick;

hymenial gelatine deep-blue with iodine.—*Lecidea deludens* Nyl. in Flora lvi. 296 (1873); Cromb. in Grevillea ii. 90; Leight. Lich. Fl. ed. 3, 323.

The apothecia usually scattered, are occasionally 2-3-confluent, the margin then being obliterated.

Hab. On quartzose stones in an alpine situation.—*B. M.* Summit of Cairn Gowar, Blair Athole, Perthshire (the only locality).

34. *B. confervoides* Krempelh. Lich.-Fl. Bay. 200 (1861).—Thallus effuse, greyish or brownish, thin, tartareous, areolate, the areolæ small, contiguous or scattered, plane or slightly convex (medulla I + blue); hypothallus blackish. Apothecia small, black, innate, sessile, plane, indistinctly marginate; hypothecium blackish-brown; paraphyses slender, conglutinate, slightly clavate, and blackish-brown at the apices; spores ellipsoid, at first colourless, becoming brown, with a hyaline epispore, 21-30 μ long, 8-14 μ thick.—*Lecidea atroalbicans* Nyl. in Flora lviii. 363 (1875); Leight. Lich. Fl. ed. 3, 328.

Exsicc. Johns. n. 511; Larb. Lich. Hb. without a number (as *Lecidea atro-albicans*).

Distinguished by the smooth thallus, by the prominent hypothallus, and also by the amyloid character of the medullary hyphæ.

Hab. On rocks.—*Distr.* Rather rare in our western counties.—*B. M.* Bangor, Carnarvonshire; Douglas Bay and Port Soderick, Isle of Man; Borealdine, Argyll; Kinloch-Rannoch, Perthshire; Loch Linnhe, Inverness-shire; Cloghan, Connemara, Galway.

35. *B. badioatra* Koerb. Syst. Lich. Germ. 223 (1855).—Thallus determinate, thickish, areolate or cracked-areolate, the areolæ plane, brownish or dark-brown (K —, CaCl —, medulla I —); hypothallus blackish. Apothecia innate, plane, thinly margined, black; hypothecium dark-brown; paraphyses coherent or lax, purplish or reddish-brown at the slightly clavate apices; epithecium blackish (K + purplish-violet); spores ellipsoid or oblong-ellipsoid, often slightly constricted in the middle, brown or at length blackish-brown, with a thin hyaline epispore, 26-36 μ long, 12-18 μ thick; hymenial gelatine deep-blue with iodine.—Mudd Man. 214, t. 4, f. 81. *Lecidea badioatra* Floerke ex Spreng. Neu. Entdeck. ii. 95 (1821); Schaer. Enum. 111; Cromb. Lich. Brit. 86; Leight. Lich. Fl. 306; ed. 3, 318.

The thallus is scarcely if at all affected by K or by CaCl. The spores rarely reach the extreme size recorded, usually they measure about 26 μ \times 14 μ .

Hab. On alpine schistose rocks.—*Distr.* Rare in N. Wales, on the Grampians, Scotland, and S.W. Ireland.—*B. M.* Cader Idris, Merioneth; Loch-na-gat, Ben Lawers, Perthshire; Killarney, Kerry.

Var. *atrobadia* A. L. Sm.—Differs from the species in the more scattered thallus and in the more marked radiating hypo-

thallus. Apothecia larger, convex, the epithecium dark-violet-brown (K+purplish); spores oblong, brown, 21–30 μ long, 10–14 μ thick.—*Lecidea atrobadia* Nyl. in Flora lv. 361 (1872); Cromb. in Grevillea i. 62; Leight. Lich. Fl. ed. 3, 318.

Hab. On a quartzose boulder in an alpine situation.—*B. M.* Summits of Ben-y-gloe, Blair Athole, Perthshire (the only locality).

36. *B. atroalba* Th. Fr. Lich. Arct. 230 (1860), pro parte.—Thallus thin greenish or brownish, tartareous, determinate, cracked-areolate, the areolæ plane or convex (medulla I+); hypothallus generally distinct and radiating from the margin. Apothecia black or brownish-black, appressed, plane or slightly convex, the margin thin or disappearing, hypothecium brownish-black; paraphyses subdiscrete, rather stout, slightly clavate and blackish at the tips; spores oblong or oblong-ellipsoid, slightly constricted at the septum, brownish, large, with a hyaline epispore, 25–36 μ long, 12–17 μ thick.—*Lichen atroalbus* L. Sp. Pl. 1141 (1753)?; Lightf. Fl. Scot. ii. 804 (1777)? (non With. Arr. ed. 3, iv. 5 (1796), which is *Lecidea aglæa* pro parte, *fide* Cromb. in Grevillea xii. 57 (1883)); Ach. Prodr. Lich. Suec. 63 (1798); Engl. Bot. t. 2336? *Lecidea atroalba* Ach. Meth. 45 (1803); Hook. Fl. Scot. ii. 36 & in Sm. Engl. Fl. v. 174 pro parte; Tayl. in Mackay Fl. Hib. ii. 116 pro parte; Cromb. Lich. Brit. 86; Leight. Lich. Fl. 305; ed. 3, 317.

Exsicc. Cromb. n. 186.

Closely allied to the preceding, but distinguished by the thinner thallus and by the usually more marked radiating hypothallus and by the amyloid hyphæ of the medulla (I+blue). The epithecium is not affected by potash.

Hab. On maritime and alpine rocks.—*Distr.* Rare in S. England, Wales, E. Scotland and Ireland.—*B. M.* Torquay, Devon; Llandyssil, Cardiganshire; I. of Arran; Saddell, Carradale, Argyll; Cove and Portlethen, Kincardineshire; Cape Clear Island and near Cork; near Ardglass, Down.

Living on other Lichens.

37. *B. Parmeliarum* Oliv. Exp. Syst. Lich. ii. 393 (1903).—Thallus none. Apothecia minute, subinnate-sessile, convex, immarginate, black, naked or greenish-pruinose; hypothecium brown; paraphyses concrete; the apices enlarged, dark-olive-brown; spores ovoid-oblong, brown, about 10–16 μ long, 4–6 μ thick, sometimes smaller or larger; hymenial gelatine not tinged with iodine.—*Lecidea Parmeliarum* Sommerf. Suppl. Fl. Lapp. 176 (1826); Cromb. Lich. Brit. 92; Leight. Lich. Fl. 357; ed. 3, 386. *Abrothallus Smithii* Tul. in Ann. Sc. Nat. sér. 3, xvii. 113 (1852); Lindsay in Quart. Journ. Micr. Sci. v. 34, t. 4, figs. 1–14 (1857); Mudd Man. 224, t. 4, f. 86. *Lichen parasiticus* Sm. Engl. Bot. t. 1866 (1808).

Brit. Exs. Leight. nos. 191, 309, 310; Mudd n. 201.

Included by some authors among fungi owing to the absence of a proper thallus, but really symbiotic with the host gonidia; it usually deforms the lobes of the host, e.g. *Parmelia saxatilis* and *P. omphalodes*, whence these were supposed by Sommerfelt to be its proper thallus. The erumpent apothecia are at length subglobose. Intermixed with these, immersed pyrenidia are of common occurrence on the alien thallus.

Hab. On the thalli of various foliaceous lichens—*Parmelia saxatilis* and var. *farfuracea*, *P. omphalodes*, *P. tiliacea*, *P. exasperata*, *Stictina fuliginosa*, *Platysma glaucum*, etc., in maritime, upland and subalpine districts.—*Distr.* General and not uncommon in Great Britain, apparently rarer in Ireland, rare in the Channel Islands.—*B. M.* Jerbourg, Island of Guernsey; Withiel, Cornwall; Torquay, Hay Tor and near the Botter Rock, Dartmoor, S. Devon; High Rocks and Eridge, Sussex; Essex; North Hill, Malvern, Worcestershire; Charnwood Forest, Leicestershire; Llyn Geirionydd, Abergavenny, Monmouthshire; Aran Mawddwy, Cader Idris and Dolgelly, Merioneth; Cwm Idwall and Beddgelert, Carnarvonshire; Ingleby Park, Cleveland, Yorkshire; High Force, Teesdale, Durham; Barcaldine and Inverary, Argyll; Glen Leohay, Killin, Craigie Hill, Perth, Craig-y-Barns, Dunkeld and Glen Shee, Perthshire; Canlochan, Forfarshire; Durris, Kincardineshire; Countesswells, near Aberdeen, Glen Callater, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Blarney, Cork; Mangerton, Killarney, Kerry; near Dawros, Connemara, Galway; Slievemore Mt., Achill Island, Mayo.

38. *B. particularis* A. L. Sm. Thallus absent. Apothecia small, plane, margined, black; paraphyses slender, not very well discrete; hymenium yellowish in thin section (K + somewhat purplish); hypothecium and perithecium blackish; spores ellipsoid, brownish-black, 8-10 μ long, 3.5-4.5 μ thick; hymenial gelatine deep-blue with iodine. *Lecidea particularis* Nyl. in Flora lx. 461 (1877); Cromb. in Grevillea vi. 113; Leight. Lich. Fl. ed. 3, 386.

Exsicc. Larb. Lich. Hb. without number.

Characterized by the structure of the apothecia and by the host upon which it occurs. The single specimen seen is fragmentary and only sparingly fertile.

Hab. On the thallus of *Boomyces rufus* (saxicolous).—*B. M.* Near Kylemore, Connemara, Galway.

39. *B. advenula* A. L. Sm. Thallus absent. Apothecia minute, plane or slightly convex, rugulose, submarginate, blackish; paraphyses concrete; epithecium purplish-black; hypothecium brownish-black (K + yellowish); spores 4 in the ascus, obtusely ellipsoid, blackish, 19-23 μ long, 10-16 μ thick; hymenial gelatine deep-blue with iodine. *Lecidea advenula* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 146, t. 22, figs. 17-20 (1876) & Lich. Fl. ed. 3, 388; Cromb. in Journ. Bot. lviii. 141 (1875).

Exsicc. Larb. Lich. Hb. n. 38.

Allied to *Lecidea epispila* Nyl. (Lich. Pyr. Or. 65), which occurs on the same host in East Pyrenees, differing, however, in being

athalline and smaller, in the darker epithecium and hypothecium, as also in the number of the rather thicker spores. The apothecia are usually somewhat scattered.

Hab. On the thallus of *Pertusaria Wulfenii* var. *rupicola* and *P. sulphurea* in mountainous districts.—*Distr.* Only a few localities in N. Wales, the S. Grampians, Scotland and W. Ireland.—*B. M.* Llanbedrog, near Pwllheli, Merioneth; The Trossachs, Perthshire; Achosragan Hill, Appin, Argyll; near Kylemore and Doughruagh Mt., Connemara.

79. **LECIOGRAPHA** Massal. Gen. Lich. 14 (1854). *Dactylospora* Koerb. Syst. Lich. Germ. 271 (1855); Mudd Man. 223. (Pl. 13.)

Thallus none. Apothecia parasitic on the thallus of other lichens, immersed then superficial, discoid black and carbonaceous; hypothecium dark-coloured; spores 8 in the ascus, oblong-ellipsoid or oblong-fusiform, 3-septate, brown.

1. **L. parasitica** Massal. l. c. & Symm. Lich. 66 (1855).—Apothecia small, sessile, at first somewhat concave, then plane, margined, black, the margin thin, entire, prominent, slightly shining; hypothecium dark-reddish-brown; paraphyses confluent, thicker and reddish-brown at the tips; spores oblong-cylindrical, 3-septate, brown, 9–15 μ long, 3.5–4.5 μ thick; hymenial gelatine deep-blue with iodine.—*Lecidea parasitica* Floerke Deutsch. Lich. 6, 3 (1819); Cromb. Lich. Brit. 94; Leight. Lich. Fl. 357; ed. 3, 387. *L. inspersa* Tul. in Ann. Sci. Nat. sér. 3, xvii. 118 (1852). *L. Zwackhii* Cromb. in Journ. Bot. xiv. 362 (1876)? *Dactylospora inspersa* Mudd Man. 224, t. 4, fig. 85 (1861).

Exsicc. Leight. n. 183; Larb. Lich. Cæsar. n. 86.

When corticolous not to be confounded with *Trachylia stigonella*, to which it bears considerable resemblance in its habits and external appearance, but from which it is separated by the spores. The apothecia are either scattered or often aggregate.

Hab. On the thallus of *Lecanora parella* and *Pertusaria communis* in maritime and upland situations.—*Distr.* General and not uncommon in England; apparently rare in the Channel Islands, Wales and S. Ireland; not seen from Scotland.—*B. M.* La Moye, Island of Jersey; near Lyndhurst, New Forest, Hants; Totnes, Lydford, and near Newton Bushell, Devon; Tilgate, Sussex; Chedworth Woods, Gloucestershire; near Twycross, Leicestershire; Hale End and near the Ragged Stone, Malvern, Worcestershire; Harboro' Magna, Warwickshire; Barmouth and near Nannau, Dolgelly, Merioneth; Aber, Carnarvonshire; Cliffrigg, Cleveland, Yorkshire; Brown's Demesne, Riverstown, Cork; Muckcross, Killarney, Kerry.

Var. **parellaria** A. L. Sm.—Paraphyses usually darker at the tips; spores remaining longer 1-septate, sometimes also 2- or 3-septate.—*Lecidea parellaria* Nyl. in Flora lix. 239 (1876); Cromb. in Journ. Bot. xiv. 362 (1876); Leight. in Trans. Linn.

Soc. (Bot.) ser. 2, i. 238, t. 32, figs. 11 & 12 (1878) & Lich. Fl. ed. 3, 387.

Exsicc. Larb. Lich. Hb. n. 189.

Hab. On the thallus of *Lecanora parella*.—*Distr.* Rare in S. England, Wales and W. Ireland.—*B. M.* Fairlight, Hastings, Sussex; near Fishguard and Manorowen, Pembrokeshire; Deganwy near Conway, Carnarvonshire; Doughruagh Mt., Connemara.

2. **L. glaucomaria** A. L. Sm.—Apothecia growing on a small pale or brown deformed patch of the host-thallus, small, brownish-black, clustered, sessile, plane with a thickish, paler, often subflexuose margin; hypothecium blackish-brown, thin, the hymenium brownish; paraphyses indistinct, coherent, thickened and black at the apices; spores oblong-ovoid, 3-septate, becoming brownish, 21–25 μ long, 8–9 μ thick; hymenial gelatine pale-blue then wine-red with iodine.—*Lecidea glaucomaria* Nyl. in Bot. Not. 1852, 177, fig. 10 & 1853, 99; Carroll in Journ. Bot. iii. 291 (1865); Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 238, t. 32, figs. 9 & 10 (1878) & Lich. Fl. ed. 3, 389. Specimen not seen.

Carroll (*l. c.*) quotes as a synonym of this species, *Schismatomma amylaceum* var. *candidum* Mudd, a variety founded on *Lichen candidus* Sm. (Engl. Bot. t. 1138), which was considered by Leighton as synonymous with his *Lecidea Turneri*, and has been already described as *Bilimbia Turneri* (p. 149).

Hab. Parasitic on the thallus of *Lecanora glaucoma*, not to be confounded with *Arthonia glaucomaria*, which grows on the apothecia of the same lichen.—*Distr.* Rare in S.W. Wales (Goodwick Bay, Pembrokeshire).

3. **L. plumbina** Anzi in Comm. Critt. Ital. i. 158 (1861).—Apothecia small, black, sessile, solitary or aggregate, plane, with a thin margin, then convex and immarginate; hypothecium brown; paraphyses conglutinate; spores narrowly fusiform, 3-septate, colourless then brownish, 22 μ long, 3 μ thick.

The specimen in the British Museum, collected by Rev. W. Johnson, and marked *Lecidea plumbina*, has somewhat large spores, 20–35 μ long, 3–4 μ thick, the paraphyses are stout, clavate, globose, and bluish-black at the tips.

Hab. On the thallus of *Coccocarpia plumbea*.—*B. M.* Lowther Park, Westmorland; Borrowdale, near Keswick, Cumberland.

4. **L. scapanaria** A. L. Sm.—Thallus whitish, effuse, minutely granular-areolate. Apothecia black, appressed, plane or slightly convex, marginate, blackish within; hypothecium brownish-black; spores oblong or ellipsoid-fusiform, brown, 3-septate, 19–23 μ long, 8 μ thick; hymenial gelatine deep-blue with iodine.—*Lecidea scapanaria* Carrington in Trans. Bot. Soc. Edinb. vii. 382 & 411, t. 10, f. 4 (1863); Cromb. Lich. Brit. 87; Leight. Lich. Fl. 358; ed. 3, 387. *L. persimilis* Nyl. Lich. Scand. 236

(1861); Stirton in Grevillea ii. 71 (1873); Leight. Lich. Fl. ed. 3, 389.

A doubtful lichen; the alteration in form of the hepatic noted by Carrington rather indicates a fungoid parasite. Further examination with fresh material is desirable.

Hab. On hepatics.—*Distr.* Rare in S. and W. Ireland and (*vide* Stirton) in Central and E. Scotland.—*B. M.* Killarney, Kerry; Dough-rugh Mt., Connemara, Galway.

80. **RHIZOCARPON** Ramond ex DC. Fl. Fr. ii. 365 (1805) pro parte. *Diplotomma* Flot. in Bot. Zeit. viii. 381 (1850) pro parte; Mudd Man. 218. (Pl. 14.)

Thallus crustaceous, usually with a distinct, dark-coloured hypothallus, or hypothallus sometimes wanting (*Diplotomma*). Algal cells Protococcaceæ. Apothecia usually dark-coloured and carbonaceous, immarginate or with a proper margin only; asci 8- or fewer-spored; spores ellipsoid or oblong, generally rather large, septate and mostly muriform, colourless or brown, usually with a hyaline, mucilaginous epispore (halonate), which, however, is not a constant character.

The genus *Diplotomma*, as understood by Mudd, included those species in which the hypothallus was but little developed and the apothecia surrounded by the thallus to form a spurious margin.

1. **Rh. perlutum** A. Zahlbr. in Engl. & Prantl, Pflanzenf. i. 1*, 138 (1905).—Thallus subdeterminate, thin, or thickish continuous or cracked areolate, glaucous-white or glaucous-ochraceous (K —, CaCl —). Apothecia somewhat large, plane, margined, rusty-red or rusty-brown, within subconcolorous, not carbonaceous, the margin usually paler; paraphyses slender, coherent; epithecium and perithecium yellow-reddish in thin section; hypothecium dark-red in the middle; spores ellipsoid-oblong, muriform, colourless, 30–42 μ long, 13–16 μ thick; hymenial gelatine bluish, the asci tawny-wine-coloured with iodine.—*Lecidea perluta* Nyl. in Flora lix. 575 (1876); Cromb. in Grevillea v. 107; Leight. Lich. Fl. ed. 3, 380.

According to Nylander has much the aspect of *Rh. ochrotropa*, a plant recorded from Finland and Madeira, but with more brightly coloured apothecia: these are scattered and occasionally approximate.

Hab. On moist quartzose rocks in an upland mountainous situation.—*B. M.* Erriff River, Connemara, Galway.

2. **Rh. Cederi** Koerb. Parerg. Lich. 232 (1861).—Thallus effuse, thinnish, minutely granular, areolate, yellowish-ferruginous (K —, CaCl —, medulla I + bluish). Apothecia small, black, almost plane, umbonate or usually somewhat plicate or wrinkled, the margin thin, flexuose; hypothecium black; paraphyses slender, bluish-green or dark-brown towards the tips; spores

oblong, colourless, or rarely brownish, 3-septate, slightly constricted at the septa, sometimes halonate, 18–24 μ long, 8–11 μ thick; hymenial gelatine bluish with iodine.—*Rh. petraeum* var. (*Ederi* Mudd Man. 220 (1861). *Lichen* (*Ederi* Web. Spicil. Fl. Goett. 182 (1778) (non Engl. Bot.)). *Lecidea* (*Ederi* Ach. Meth. 49 (1803); Leight. Lich. Fl. 329; ed. 3, 349. *L. petraea* subsp. (*Ederi* Croub. Lich. Brit. 87.

Exsicc. Leight. n. 187; Larb. Lich. Hb. n. 179.

Often confused with *Lecidea Dicksonii* (see p. 89) on account of the rusty-red colour of the thallus.

Hab. On maritime and mountainous rocks.—*Distr.* Not uncommon throughout Great Britain and Ireland; not recorded from the Channel Islands.—*B. M.* Near Launceston, Cornwall; Garn Dwad, Llanwrtyd, Breconshire; Barmouth and Dolgelly, Meriotheth; Trefriw, Carnarvonshire; Lounsdale, Cleveland, Yorkshire; Kentmere, Mardale, and Ulphthwaite, Westmorland; King's Park, near Edinburgh; Nigg, Kincardineshire; Ben Vrackie and Ben Lawers, Perthshire; Appin, Argyll; Glen Callater, Glen Ey and Castleton, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Ballinakill, Connemara, Galway; Belleclare, Mayo.

3. *Rh. alboatrum* Th. Fr. Lich. Arct. 237 (1860).—Thallus effuse, whitish or greyish, somewhat areolate or granular or almost disappearing (K —, CaCl —); hypothallus wanting. Apothecia small, black, sometimes whitish-pruinose, adnate, convex, sometimes with a spurious white margin; hypothecium dark-brown; paraphyses slender, capitate and dark-brown at the tips; spores ellipsoid, becoming brown, 1- or 3-septate or irregularly muriform, not halonate, 12–22 μ long, 7–10 μ thick; hymenial gelatine deep-blue with iodine.—*Lichen alboater* Hoffm. Enum. Lich. 30 (1784). *L. corticola* Ach. in Vet. Acad. Handl. 1795, 137, t. 5, f. 6; Dicks. Pl. Crypt. iv. 20 (1801); Engl. Bot. t. 1892. *Lecidea corticola* Ach. Meth. 53 (1803); S. F. Gray Nat. Arr. i. 469 (1821) pro parte. *Patellaria leucoplaca* DC. Fl. Franc. v. 347 (1805)? *L. alboatra* Fr. Lich. Eur. 336 (1831); Hook. in Sm. Engl. Fl. v. 180; Croub. Lich. Brit. 87 (incl. var. *leucoplaca*); Leight. Lich. Fl. 326 (incl. f. *leucoplaca*); ed. 3, 346 (incl. f. *populorum*). *Diplotomma alboatrum* Flot. ex Massal. Ric. Lich. 98 (1852); Mudd Man. 218, t. 4, f. 82 (incl. vars. *trabellinum* and *populorum*).

Exsicc. Leight. n. 64; Mudd nos. 188 (as *Buellia disciformis* var. *rugulosa*), 191, 192 (var. *populorum*); Larb. Lich. Hb. n. 176; Johns. n. 396.

The spores are extremely variable in size and form even in the same apothecium. As in many other lichens, the outward characters are liable to be influenced by the prevailing conditions of shade and moisture, and by the nature of the substratum, which give rise to local variations of growth. A number of such forms have been distinguished. Var. *trabinella* (*Lecidea alboatra* var. *trabinella* Fr. l. c.) represents a somewhat warted form of thallus with the apothecia crowded, often confluent

and immarginate. In var. *populorum* (*Diplotomma populorum* Massal. Ric. Lich. 99 (1852); *Lecidea parasema* var. *athroa* Ach. Meth. 36) the thallus is limited and forms whitish patches on the trunks of poplars and other trees, occasionally also on rocks. A variety *crenulata*, Koerb. l. c., characterized by the pulverulent, crenulate margin of the apothecia, was collected by Crombie in Windsor Great Park.

Hab. On trees and palings.—*Distr.* General and common in England and the Channel Islands. Apparently rare in Scotland, not unfrequent in Ireland.—*B. M.* Shanklin, I. of Wight; Bovey Tracey, Devon; near Lymington, Hants; Ightham, Kent; St. Leonard's Forest, and Elmer, Middleton, Sussex; Braxted Park, Langford, Ovingdean and Quendon, Essex; near Cheltenham and Sapperton, near Cirencester, Gloucestershire; Windsor Great Park, Berks; Nannau, Dolgelly, Merioneth; Twycross, Leicestershire; Montford Bridge near Shrewsbury, Oswestry and Wafield, Shropshire; near Alfrick, Church-hill, Kempsey, and Spetchley, Worcestershire; Tetsworth, Oxfordshire; Seething, Norfolk; Ettersgill; Teesdale, Durham; Sowerdale, Cleveland, Easby and Ayton and near Masham, Yorkshire; Airds House Appin, Argyll; Finlarig, Killin, Perthshire; Limerick, Clare.

Var. *venustum* A. L. Sm.—Thallus thickish, white. Apothecia somewhat larger, immersed, then emerging and subconvex, with a spurious white margin.—*Diplotomma venustum* Koerb. Parerg. Lich. 179 (1860). *Lecidea calcarea* Leight. Lich. Fl. 327; ed. 3, 348 (non *Lichen calcareus* Weis).

Hab. On rocks, also on mortar.—*Distr.* Rare in the Channel Islands, S. England, Scotland? and W. Ireland.—*B. M.* Green Island, Jersey; near Penzance, Cornwall; near Chichester, Sussex; Levens Hall, Westmorland; Barcaldine, Argyll; Killkee, Clare.

Var. *epipolium* A. L. Sm.—Thallus white, effuse or limited, tartareous, cracked-areolate or subpulverulent. Apothecia black, white- or bluish-grey-pruinose, immersed, then erumpent, at first plane, becoming convex, with or without a proper margin, often with a spurious thalline margin.—*Lichen epipolius* Ach. Lich. Suec. Prodr. 58 (1798); Engl. Bot. t. 1137. *Lecidea epipolia* Ach. Meth. 53 (1803); S. F. Gray Nat. Arr. i. 468. *L. alboatra* var. *epipolia* Schær. Enum. 122 (1850); Cromb. Lich. Brit. 87; f. *epipolia* Leight. Lich. Fl. 327; ed. 3, 347. *Diplotomma alboatrum* var. *epipolium* Mudd Man. 218 (1861) (excl. corticolous habitat).

Exsicc. Leight. n. 241; Mudd n. 193; Larb. Lich. Hb. nos. 177, 178 (as var. *ambigua*); Carroll Lich. Hib. n. 21; Johns. nos. 357, 431 (var. *margaritacea*), 432 (f. *ambigua*).

Often with the appearance of a *Lecanora* owing to the immersed apothecia being closely surrounded by the thallus. A number of forms have been recorded by Leighton and others characterized by various states of the apothecia and of thalline development;—f. *margaritacea* Leight. l. c. (*Lecidea margaritacea* Ach. Lich. Univ. 185 (1810) pro parte; S. F. Gray Nat. Arr. i. 468), the apothecia are more deeply immersed, with a somewhat more pronounced thalline margin;

in *f. murorum* Leight. *l. c.* 348, the apothecia are minute and also deeply immersed, the thallus thin and pale-yellowish; *f. ambigua* Leight. *l. c.* (*Lecidea ambigua* Ach. Lich. Univ. 161) has a thin cracked sometimes dispersed greyish thallus, the apothecia becoming superficial and with a proper margin only.

Hab. On rocks and stones.—*Distr.* General and common in the Channel Islands and England and Wales. Somewhat rare in Ireland, rare in Scotland.—*B. M.* Green Island, Jersey; near Lewes, Newhaven and Downs, Sussex; Newlyn Cliff, Cornwall; Shanklin, I. of Wight; near Cirencester and Selsby Hill, Gloucestershire; Walthamstow, Little Baddow and Wickham Bishops, Essex; Twycross, Leicestershire; near Tenby, Pembrokeshire; Llangollen, Denbighshire; Malvern, Worcestershire; near Yarmouth and Market Dereham, Norfolk; Cherry Hinton Church, Cambridgeshire; Humphrey Head, Lancashire; Port Soderick, I. of Man; Pinching Thorpe Wood and near Aytton, Cleveland, Yorkshire; Red Screes, Heversham Head, near Kendal, and near Staveley, Westmorland; Calder Abbey, St. Bees and Hart-side Fell, Cumberland; Achosragan Hill, Appin, Argyll; Ben Lawers, Perthshire; near Cork; Ross, Clare; Killery Bay, Lettermore and Doughruagh Mt., Connemara, Galway; Achill Isl., Mayo.

4. *Rh. chlorophæum* A. L. Sm.—Thallus yellowish-white, warted or cracked-areolate, unequal, scattered or subdeterminate (K + yellow, then red). Apothecia small, subinnate-sessile, black, slightly pruinose, plane or convex; hypothecium dark-brown; paraphyses rather stout, discrete, thickened and brown at the tips; spores dark-brown, oblong, 3-septate and irregularly muriform, brown, without an epispore, 15–20 μ long, 10–12 μ thick; hymenial gelatine blue with iodine.—*Lecidea chlorophæa* Hepp ex Leight. Lich. Fl. 328 (1871); ed. 3, 348.

Closely allied to var. *epipolium* of the preceding species, but differing in the more constantly muriform spores and in the thalline reaction.

Hab. On rocks and flints.—*Distr.* Rare in S. and N. England and S. Wales.—*B. M.* St. Merryn, Cornwall; Peel, I. of Man; Tenby, Pembrokeshire.

5. *Rh. soreumidium* A. L. Sm.—Thallus pale or pallid-greyish, thickish, wrinkled or warted-congested, limited (K —, CaCl —). Apothecia crowded, sessile, small at first, plane, wrinkled, margined and bluish-grey-pruinose, becoming convex and immarginate and often connate; hypothecium dark-brown or brown-reddish; paraphyses indistinct, somewhat irregular, dark-reddish-brown at the tips and granular-inspersed; spores ellipsoid, 3-septate and generally muriform, brown, 13–20 μ long, 8–10 μ thick; hymenial gelatine deep-blue with iodine.—*Lecidea soreumidia* Stirton in Scott. Nat. iv. 29 (1877); Leight. Lich. Fl. ed. 3, 375.

Perhaps only a form of *Rh. alboatrum*.

Hab. On dead wood.—*Distr.* Alpine districts in Scotland (Ben Brecht, Argyll).

6. **Rh. geographicum** DC. Fl. Fr. ii. 365 (1805).—Thallus citrine or bright-greenish-yellow, determinate, thickish or rather thin, areolate, the areolæ smooth, plane, contiguous or sub-contiguous (K —, CaCl —, medulla I + bluish); hypothallus black. Apothecia small or moderate in size, innate, plane or somewhat convex, marginate, black; hypothecium blackish; paraphyses conglutinate, variously dark-coloured at the apices; spores broadly fusiform-oblong, very dark-coloured, sometimes halonate, 3-septate, frequently with longitudinal or oblique septa, 24–40 μ long, 11–18 μ thick; hymenial gelatine deep-blue with iodine.—Mudd Man. 221, t. 4, fig. 83 pro parte. *Lichenoides nigro-flavum*, *tabulæ geographicæ instar pictum* Dill. Hist. Musc. 126, t. 18, f. 5 (1741). *Lichen geographicus* L. Sp. Pl. 1607 (1753); Huds. Fl. Angl. 442; Lightf. Fl. Scot. ii. 801; Engl. Bot. t. 245; With. Arr. ed. 3, iv. 12 (1796). *Lecidea geographica* Schær. Spicil. 124 (1828) & Enum. 105, t. 5, f. 3 pro parte; Hook. in Sm. Engl. Fl. v. 178 pro parte; Tayl. in Mackay Fl. Hib. ii. 121; Cromb. Lich. Brit. 93; Leight. Lich. Fl. 346; ed. 3, 372 pro parte. *L. atrovirens* var. *geographica* Hook. Fl. Scot. ii. 37 (1821); S. F. Gray Nat. Arr. i. 465.

Exsicc. Bohl. n. 17. pl.; Johns. nos. 454, 455 (as f. *contigua*); Leight. nos. 128, 129, 306; Mudd n. 196; Larb. Lich. Hb. n. 352 (f. *contigua*).

A variable plant both as to thallus and apothecia. In its more typical and developed state, the thallus, which often spreads extensively, is limited and usually intersected by the black hypothallus, so that, as Dillenius says, "it is divided, as it were, into compartments like a map," whence its specific name. When the thallus is contiguous at the circumference, it is var. *contiguum* (Mudd l. c.; *Lecidea geographica* var. *contigua* Fr. Lich. Eur. 327 (1831); f. *contigua* Leight. Lich. Fl. ed. 3, 373). The numerous apothecia situated either on or between the areolæ are at times more or less confluent, the margin usually very thin and occasionally more developed, becoming tumid and prominent (var. *urceolatum* Mudd l. c.; *Lecidea geographica* var. *urceolata* Schær. Enum. 106 (1850); f. *urceolata* Leight. l. c. 374).

Hab. On rocks and boulders, granitic, schistose, quartzose and arenaceous, from maritime to alpine situations.—*Distr.* General and abundant in most parts of Great Britain, where it attains the summits of the highest mountains; not uncommon in the Channel Islands; apparently rarer in Ireland.—*B. M.* La Moye, Jersey; Islands of Guernsey and Alderney; Pentire, St. Minver, Temple Moor and Lamynack Cliff, near Penzance, Cornwall; Dartmoor, Devon; near Richard's Lock, Ulting, Essex; Bardon Hill and Charnwood Forest, Leicestershire; Malvern Hills, Worcestershire; Cader Idris, Aberdovey, Barmouth, and Corwen, Merioneth; Glyder and Capel Curig (f. *urceolatum*), Carnarvonshire; Hafod, Cardiganshire; Longmynd, Wrekin Hill, Caer Caradoc and Pontesford Hill, Shropshire; Battersby Moor (f. *urceolatum*), Kildale Moor and Lounsedale, Cleveland, Yorkshire; Teesdale, Durham; Alston and Lamplugh, Cumberland; Red Screes, Westmorland; The Cheviots, Northumberland; near Loch Skene, Moffatdale, Dumfriesshire; Arthur's Seat, Edinburgh;

Glen Creran, Argyll; Sidlaw Hills, Forfarshire; Craig Calliach, Ben Lawers and Birnam Hill, Dunkeld, Perthshire; near Portlethen, Kincardineshire; Morrone, Braemar, and Huntly, Aberdeenshire; Ben Nevis, Inverness-shire; Cuchullin Hills, I. of Skye; near Loch Shin, Sutherland; Keim-an-Eigh, Cork; Killarney, Kerry; Corraun Mt., and Slievemore Mt., Achill Isl., Mayo.

Var. *atrovirens* Koerb. Syst. Lich. Germ. 263 (1855).—Thalline areolæ smaller, more or less scattered and somewhat convex; hypothallus very distinct, often predominating. Apothecia plane or tumid, situated between the areolæ.—Mudd Man. *l. c.* *Lichen atrovirens* L. Sp. Pl. 1607 (1753); Huds. Fl. Angl. ed. 2, 525; Lightf. *l. c.*; With. *tom. cit.* 13. *Lecidea atrovirens* Hook. Fl. Scot. *l. c.*; S. F. Gray Nat. Arr. i. 465. *Lecidea geographica* var. *atrovirens* Schær. Spicil. *l. c.*; Cromb. Lich. Brit. 93 & Journ. Linn. Soc. (Bot.) xxi. t. 9, f. 4 (1885); Leight. Lich. Fl. 346; ed. 3, 373 (as form).

Perhaps only a less developed thalline condition of the species. When the areolæ are thinly scattered and the hypothallus predominates it is f. *protothallinum* Koerb. (*l. c.*). The spermatogones are more frequent than when the thallus is more developed, the spermatia cylindrical, nearly straight.

Hab. On rocks and boulders (calcareous excepted) in maritime and mountainous districts.—*Distr.* No doubt similar to that of the species, though seen from comparatively few localities, chiefly in Scotland.—*B. M.* Roughton, Cornwall; Ben-y-gloe, Blair Athole, Perthshire; Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; Hills of Applecross, Ross-shire; Letter Hill, Connemara, Galway.

Var. *lecanorinum* Floerke ex Koerb. *l. c.*—Thalline areolæ, somewhat discrete and convex. Apothecia immersed in the areolæ, with a spurious margin; spores usually halonate, submuriform 30–40 μ long, 11–16 μ thick.—*Lecidea geographica* var. *cyclopica* Nyl. Lich. Scand. 248 (1861); Leight. Lich. Fl. 346; f. *cyclopica* ed. 3, 374.

Exsicc. Johns. n. 398.

Well distinguished by the somewhat longer spores and by the character of the apothecia, which are single in each of the areolæ and appear as if lecanoroid from the spurious thalline margin.

Hab. On slate rocks.—*Distr.* Rare in upland or mountainous districts in N. England and the Grampians, Scotland.—*B. M.* Lakeside, Ennerdale, Cumberland; Morrone, Braemar, Aberdeenshire.

Var. *geronticum* Th. Fr. Lich. Scand. 622 (1874).—Thalline areolæ subplane or convex, scattered or subcontiguous, somewhat rugose, white, subpulverulent. Apothecia plane, immersed in the areolæ.—*Lecidea atrovirens* var. *gerontica* Ach. Meth. 45 (1803). *L. geographica* var. *gerontica* Nyl. Lich. Scand. 248 (1861); Cromb. Lich. Brit. *l. c.*; Leight. Lich. Fl. 347; ed. 3, 374 (as form).

Well characterized by the colour of the more or less pulverulent thallus, whence Schärer (Spicil. 124, 193) termed it var. *pulverulenta*. It is rather interesting as being the only state of the species which occasionally occurs on a calcareous substratum.

Hab.—On quartzose, occasionally calcareous, boulders and stones in mountainous regions.—*Distr.* Rare in the Grampians, Scotland.—*B. M.* Morrone, Braemar, Aberdeenshire; Ben Nevis, Ross-shire.

7. *Rh. viridiatrum* Koerb. Syst. Lich. Germ. 262 (1855).—Thallus greenish-yellow, indeterminate, granular-areolate, the areolæ discrete or crowded (K —, CaCl —, medulla I —); hypothallus distinct or little visible. Apothecia small, black, prominent, convex and immarginate; hypothecium blackish; paraphyses coherent, blackish at the tips; spores fusiform-oblong or ellipsoid, 3-septate and sometimes muriform, blackish, 18–25 μ long, 9–11 μ thick; hymenial gelatine deep-blue with iodine.—*Rh. geographicum* var. *sphaericum* Mudd Man. 221. *Lecidea viridiatra* Floerke Deutsch. Lich. iv. 4 (1819). *L. geographica* var. *sphaerica* Schær. Enum. 106 (1850); f. *sphaerica* Leight. Lich. Fl. ed. 3, 373 (1879); var. *viridiatra* Leight. Lich. Fl. 347 (1871).

Exsicc. Johns. n. 456; Leight. n. 93.

Distinguished from the preceding by the smaller spores and by the absence of medullary reaction with iodine (hyphæ not amyloid). The apothecia arise either from the hypothallus or from the areolæ.

Hab. On rocks and boulders in hills and mountainous districts.—*Distr.* Seen from only a few localities in England, Wales and S. Ireland; but no doubt to be detected also in S. Scotland.—*B. M.* Cothelstone, Taunton, Somerset; Malvern Hills, Worcestershire; Llandegly, Radnorshire; Haughmond Hill and Longmynd, Shropshire; Cliffrigg, Cleveland, Yorkshire; Alston, Cumberland; near Bantry, Cork; Cloghan, Killarney, Kerry.

8. *Rh. calcareum* Th. Fr. Lich. Arct. 236 (1860).—Thallus thickish, white, orbicular, determinate, tartareous, cracked-areolate in the centre, radiate at the circumference (K —, CaCl —); hypothallus wanting. Apothecia immersed or depressed, concave becoming plane, black, sometimes pruinose, the margin thick, becoming thin and flattened; hypothecium blackish-brown; paraphyses confluent, olivaceous or brownish towards the apices; spores ellipsoid or oblong-ellipsoid, obtuse, colourless, then brownish or greenish-brown, large, muriform, often with a distinct hyaline epispore (halonate), 22–30 μ long, 12–18 μ thick; hymenial gelatine deep-blue with iodine.—*Lichen calcareus* Weis. Pl. Crypt. Gött. 40 (1770). *L. rimosus* Dicks. Plant. Crypt. i. 12 (1785); With. Arr. ed. 3, iv. 25; Engl. Bot. t. (1736). *L. speireus* Sm. Engl. Bot. t. 1864 (1808) (non Ach.) *Lecidea speirea* (1821); S. F. Gray Nat. Arr. i. 468 (1821) (non Ach.); Hook. in Sm. Engl. Fl. v. 180; Tayl. in Mackay Fl. Hib. ii. 125. *L. con- tigua* subsp. *confluens* f. *calcareus* Nyl. Lich. Scand. 225 (1861);

Cromb. Lich. Brit. 80. *L. rimosa* Leight. Lich. Fl. 350 (1871); ed. 3, 379. *Diplotomma calcareum* Koerb. Syst. Lich. Germ. 220 (1855); Mudd Man. 219.

Exsicc. Bohl. 121, f. 1, pl.; Johns. n. 397.

There has been considerable confusion in the identification of *Lichen speireus*. The Engl. Bot. specimen (t. 1864) is undoubtedly a synonym of *Lichen calcarius*, so also is Dickson's *L. rimosus*. *Lichen speireus* Ach. Lich. Succ. Prodr. 59 (1798) is synonymous with *Lecidea cinerascens*.

Hab. On calcareous rocks.—*Distr.* Not uncommon in maritime or upland regions of the British Isles.—*B. M.* Downs and Newhaven, Sussex; Garth Hill, Knighton, Radnorshire; Llanymynech, Shropshire; Beddgelert and Snowdon, Carnarvonshire; Llangollen, Denbighshire; I. of Anglesea; near Buxton, Derbyshire; Carlton Bank, Cleveland and Dent, Yorkshire; Egglestone and Teesdale, Durham; Mallerstang, Westmorland; Hartside Fell, Cumberland; Achosragan Hill, Appin, Argyll; Ben-y-Gloe, Ben Lawers and Craig Tulloch, Blair Athole, Perthshire; Canlochan, Forfarshire; Craig Guie and Morrone, Braemar, Aberdeenshire; Portmarnock, near Dublin; Castlebar, Mayo.

9. *Rh. petræum* Massal. Ric. Lich. 102 (1852) (non Koerb.).—Thallus white or greyish-white, orbicular, determinate, thin, wrinkled or almost smooth, subcontinuous or cracked-areolate, sometimes thin and almost disappearing (K —, CaCl —, I —); hypothallus evanescent. Apothecia black, small, usually growing in concentric lines, appressed or usually subinnate, somewhat concave or plane, marginate, the margin thick and often white-pruinose; hypothecium blackish-brown; spores oblong, muriform, colourless or slightly brownish, often halonate, 25–44 μ long, 11–17 μ thick; hymenial gelatine deep-blue with iodine.—*Lichen petræus* Wulfen in Jacquin Collectan. Botan. iii. 116, t. 6, f. 4 (1789). *L. concentricus* Davies in Trans. Linn. Soc. ii. 284 (1794); Engl. Bot. t. 246; With. Arr. ed. 3, iv. 18. *Lecidea petræa* Ach. Meth. 37 (1803); S. F. Gray Nat. Arr. i. 463; Hook. in Sm. Engl. Fl. 175; Tayl. in Mackay Fl. Hib. ii. 117 pro parte; subsp. *concentrica* Nyl. Lich. Scand. 234 (1861); Cromb. Lich. Brit. 87. *L. concentrica* Leight. Lich. Fl. 349 (1871); ed. 3, 378. *Rhizocarpon petræum* var. *concentricum* Mudd Man. 220 (1861).

Exsicc. Bohl. n. 57, pl.; Leight. n. 17; Johns. n. 354, 355.

The specific name *petræum* has been given by later British authors to forms now included under *Rh. confervoides*, but Wulfen's description and figure of *Lichen petræus* undoubtedly represent this species with its concentrically arranged apothecia, and his name takes precedence of the more characteristic *concentricus* of Davies. Sometimes it is regarded as only a variety of the preceding species, but is easily recognized and differentiated, even when the thallus is almost evanescent, by the peculiar lines formed by the contiguous apothecia. Leighton's f. *typica* (Lich. Fl. ed. 3, 378) is a condition in which the thallus is well developed and almost continuous; in f. *impressula*

Leight. and f. *coarctata* Leight. (*l. c.* 379) the apothecia are more concave and at times circumscissed; in the latter the thallus is also diffuse or scattered. The spermatogones are not uncommon, the spermatia rod-shaped, $6\ \mu$ long, $6\ \mu$ thick.

Hab. On rocks, chiefly calcareous, more rarely schistose and arenaceous.—*Distr.* Frequent in maritime and upland regions.—*B. M.* Wadebridge, Cornwall; near Beeding and Sullington Heath and Graffham Down, Sussex; Ullacombe, Dartmoor, Devon; Leith Hill, Surrey; Wickwar, Gloucestershire; Malvern Hills, Worcestershire; near Ledbury, Herefordshire; Oswestry, Shropshire; Charnwood Forest, Leicestershire; near Llandovery, Carmarthenshire; Cader Idris and Dolgelly, Merioneth; Capel Curig, Carnarvonshire; Llangollen, Denbighshire; I. of Anglesea; Bilsdale, Cleveland, Yorkshire; near Brigsteer and near Kendal and Shap, Westmorland; St. Bees and Alston, Cumberland; S. Queensferry, Linlithgow; Pentland Hills, near Edinburgh; near Balmerino, Fife; Baldovan, Forfarshire; Glen Lochay, Killin, Perthshire; Killarney, Kerry; Devil's Glen, Wicklow.

Var. excentricum A. L. Sm. (non Boist. *Nouv. Fl. Lich.* pt. 2, 240 (1902)).—Thallus whitish, effuse, less developed than in the species, sometimes almost evanescent. Apothecia numerous, scattered irregularly over the thallus, rarely in indistinct lines, sometimes innate and circumscissed as in the species.—*Lecidea petraea* var. *excentrica* Ach. *Meth.* 37 (1803); subsp. *excentrica* Nyl. *Lich. Scand.* 234; *Cromb. Lich. Brit.* 87. *L. concentrica* var. *excentrica* Leight. *Lich. Fl.* 350 (1871). *L. excentrica* Leight. *Lich. Fl. ed. 3*, 379 (1879).

Exsicc. Johns. n. 457; *Larb. Lich. Hb.* n. 75; Mudd n. 194 (as *Diplotomma calcareum*).

Retained as a variety of the preceding but distinguished only by the more irregularly placed apothecia. Leighton notes a difference in the "albo-suffused" margins of the apothecia in the species, but that is not a constant character.

Hab. On calcareous or arenaceous rocks.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Jersey; Broomfield, Essex; Bultih, Breconshire; Llanymynech, Shropshire; Dolgelly and Cader Idris, Merioneth; Carlton Bank, Cleveland, Yorkshire; Whitehaven, Cumberland; Achosragan Hill, Appin, Argyll; Morrone, Braemar, Aberdeenshire.

10. *Rh. confervoides* DC. *Fl. Franc.* ii. 366 (1805) emend. (non Massal.).—Thallus subdeterminate or effuse, often in small patches, greyish-white or -brown, finely areolate, the areolæ contiguous or dispersed, convex or depressed, on a thin black spreading often fimbriate hypothallus. Apothecia numerous, moderate in size, black, innate-sessile, plane, with a thin margin; hypothecium thick, brownish-black; paraphyses lax, involved in mucilage, slender and thickly septate, clavate and greenish-brown at the tips; spores oblong, ovate or ellipsoid, at first colourless, becoming dark-coloured, often halonate, irregularly muriform, $20\text{--}38\ \mu$ long, $10\text{--}17\ \mu$ thick; hymenial gelatine blue

with iodine.—*Rh. petræum* Koerb. Syst. Lich. Germ. 260 (1855) pro parte (non Massal.); Mudd Man. 220 (excl. vars.). *Lecidea petræa* Tayl. in Mackay Fl. Hib. ii. 117 (1836) pro parte; Flot. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 374 (1856) (excl. vars.); Cromb. Lich. Brit. 86 (excl. vars.); Leight. Lich. Fl. 347; ed. 3, 375 pro parte; var. *amphibia* Nyl. Lich. Scand. 234 (1861). *L. amphibia* Fr. Lich. Eur. 307 (1831); Cromb. in Journ. Bot. viii. 98 (1870).

Exsicc. Leight. n. 159, 189 (in B.M. set as *Lecidea verruculosa*); Mudd n. 195; Larb. Lich. Hb. n. 234 (as var. *cinereum*); and Lich. Cantab. n. 33; Johns. n. 443.

Has been frequently confused with *Lichen petræus* Wulfen as already noted. A leading character, as described by De Candolle, is the rhizoid-like hypothallus which, along with the often dispersed thalline areolæ, distinguishes it from allied species. The apothecia are usually marginate, sometimes minutely umbonate and less innate than in *Rh. petræum*. Specimens from the Stirton and Martindale herbaria determined as *Rh. reductum* Th. Fr. (Lich. Scand. 633 (1874)) belong to this species.

Nylander (Flora lxiv. 188 (1881)) and others distinguish two species, morphologically alike, but differing in their reaction to potash. In one no reaction follows, in the other, *Rh. eupetræum* A. Zahlbr. a yellow colour results followed by red. The specimens of *Rh. confervoides* in the British Museum give no reaction with potash. Several forms are recorded by Leighton (Lich. Fl. ed. 3, 375) representing various states of the thallus: in f. *albicans* (*Rh. petræum* f. *albicans* Flot. ex Koerb. l. c.) the whitish thalline areolæ are crowded, almost concealing the hypothallus; in f. *cinereum* (Flot. l. c.), often found on stones and flints, the fimbriate hypothallus spreads over the smooth surface of the substratum, outdistancing the thalline areolæ. It predominates also in f. *coracinum* (Flot. l. c.) where the areolæ are dark and diffuse, in f. *dispersum* Leight. where they are light coloured and scattered, and in f. *fuscescens* Leight. where the areolæ are also light in colour but contiguous and very thin. Th. Fries (Lich. Scand. 630 (1874)) describes a species, *Rh. amphibium*, based on *Lecidea amphibia*. From the description it differs chiefly in habitat (inundated rocks).

Hab. On hard rocks, granitic, schistose, or siliceous.—*Distr.* General and common throughout the British Isles.—*B. M.* St. Boniface Down, Ventnor, I. of Wight; Lyndhurst, Hants; Beeding Downs, Stanmer Park and Hastings, Sussex; Shere, Surrey; Lydd, Kent; High-beach, Epping Forest, Essex; Bosbury Ring and Caer Caradoc, Shropshire; Middletown Hill, Montgomeryshire; Barmouth and Dolgelly, Merioneth; Thetford Warren, Norfolk; Cliffrigg, Lonsdale and Ayton, Cleveland, Yorkshire; Ravensborrow and Staveley, Westmorland; near Penrith and Alston, Cumberland; Portlethen, Kincardineshire; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Cork; Killkee, Clare; Howth, Dublin; Clare Isl. and Achill Isl., Mayo.

11. *Rh. postumum* Th. Fr. Lich. Scand. 634 (1874).—Thallus effuse, thin, subgranulose, scattered or evanescent, greyish (K —, CaCl —, medulla I —), hypothallus indistinct. Apothecia

subminute, somewhat plane and thinly margined, at length convex and immarginate, black, paraphyses concrete; epithecium and hypothecium brownish; spores (6-) 8 in the ascus, ellipsoid-oblong, 3-septate, usually with a few oblique or longitudinal septa, colourless or at length brownish, scarcely halonate, 15-16 μ long, 6-7 μ thick, or shorter and rather thicker; hymenial gelatine bluish, the asci wine-red with iodine.—*Lecidea postuma* Nyl. in Flora li. 345 (1868); Cromb. in Journ. Bot. vii. 50 (1869) & Lich. Brit. 87; Leight. Lich. Fl. 328, ed. 3, 349.

A rather obscure plant, related to *Rh. confervoides*, of which Nylander says it would almost appear to be a starved condition, with smaller spores. In the specimens gathered the thallus is scarcely visible, except around the somewhat scattered apothecia, and there is no visible hypothallus.

Hab. On calcareous stones among detritus in an alpine situation.
—*B. M.* Ben Lawers, Perthshire.

12. *Rh. lotum* Stizenb. ex Bausch Flecht. Baden, 152 (1869).—Thallus effuse, thin, pulverulent, pale-ochraceous or cinereous-grey (K —, CaCl —, I —); hypothallus not evident. Apothecia minute, scattered or congregate, sessile, black, with a persistent margin; hypothecium reddish-brown; paraphyses rather slender involved in mucilage, the apices clavate and 1-3-septate, blackish-brown; asci clavate-ovoid, 8-spored; spores sparsely muriform, with a narrow episporium, at first colourless, then pale-brown, 18-22 μ long, 8-10 μ thick.—*B. de Lesd.* in Bull. Soc. Bot. Fr. liii. 517 (1906); Lillie in Scott. Bot. Rev. 1912, 153; A. L. Sm. Monogr. i. 477 (1918).

Hab. On granitic rocks. Collected by D. Lillie at Houstry, Dunbeath, Caithness.

13. *Rh. distinctum* Th. Fr. *op. cit.* 625.—Thallus greyish or brownish-yellow, areolate, the areolæ plane or convex (K — or slightly brownish, CaCl —); hypothallus black. Apothecia large or rather small, depressed, plane, thinly margined or immarginate; hypothecium purplish-brown; paraphyses slender, involved in mucus, purplish-brown at the tips; spores oblong, ellipsoid, or irregular in form, colourless, becoming pale-olive, 1-5-septate and muriform, halonate, 24-32 μ long, 12-15 μ thick; hymenial gelatine deep-blue with iodine.

Differs from *Rh. confervoides* in the purple tinge of hypothecium and epithecium.

Hab. On granitic or sandstone rocks.—*Distr.* Rare in N. England and N. Scotland.—*B. M.* Lazonby, Cumberland; Kinloch-Rannoch, Perthshire; Morrone, Braemar, Aberdeenshire.

14. *Rh. obscuratum* Massal. Ric. Lich. 103 (1852).—Thallus greyish- or pale-brown, thin, minutely areolate, the areolæ

contiguous or dispersed, nearly plane, sometimes evanescent (K + pale-yellow, CaCl —); hypothallus black, often obsolete. Apothecia black, varying in size, plane, innate-sessile or adnate with an obtuse, thick margin, which rarely almost disappears; hypothecium brownish-black; paraphyses slender, coherent, dark-brown towards the apices; spores oblong-ellipsoid, colourless, becoming brownish, muriform, halonate, 24–50 μ long, 12–18 μ thick; hymenial gelatine deep-blue with iodine.—*Rh. petræum* var. *lavatum* Mudd Man. 220 (1861). *Lecidea petræa* var. *obscurata* Ach. Lich. Univ. 156 (1810); f. *lavata* Cromb. Lich. Brit. 86 (1870). *L. obscurata* Schaer. Spicil. 130 (1828); Leight. Lich. Fl. ed. 3, 377. *L. atroalba* var. *concreta* Wahlenb. Fl. Lapp. 471 (1812). *L. concreta* Leight. Lich. Fl. 351 (1871). *L. lavata* Nyl. in Flora lvi. 23 (1873); Cromb. in Journ. Bot. xi. 135 (1873); Leight. Lich. Fl. ed. 3, 378.

The thallus is occasionally shining and almost copper-brown or sometimes tinged a rusty-red (f. *ferrata* Nyl. Lich. Scand. 234 (1861)). The apothecia vary in size, but are usually rather large, strongly marginate, and occasionally also umbonate. When growing on rocks liable to be submerged, the thallus almost disappears (f. *lavata*).

Hab. On rocks.—*Distr.* Somewhat rare in upland or subalpine regions.—*B. M.* Islington, Devon; Pulborough, Sussex; by R. Tovy, Ystrad-ffin, Carmarthenshire; Llandyssil, Cardiganshire; Aberdovey, Merioneth; Anglesea; Nant Francon and Trefriw Falls, Carnarvonshire; Caradoc, Shropshire; Port Soderick, I. of Man; near Thirsk, Yorkshire; Ravensborrow Crag, Westmorland; Westdale, Cumberland; Portlethen, Kincardineshire; Barcaldine, Argyll; Stirlingshire; Ben Lawers, Perthshire (f. *ferrata*); Glen Callater, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire; Applecross, Ross-shire; Killarney, Kerry.

Subsp. *roridulum* Th. Fr. Lich. Scand. 629 (1874).—Thallus verrucose-areolate grey or with a pinkish tinge (persicine), hypothallus obsolete. Apothecia up to 1 mm. wide, sometimes umbonate blackish, marginate; paraphyses reddish-brown towards the apices.

Our specimens were collected and determined by J. M. Martindale. The subspecies differs in the much more developed areolæ of the thallus and in the brighter colour of thallus and paraphyses. Th. Fr. gives a smaller size for the spores, but in Martindale's specimens they are as large as in the species.

Hab. On rocks in upland districts.—*B. M.* Ravensborrow Crag, Westmorland.

15. *Rh. plicatile* A. L. Sm.—Thallus dirty-white, minutely plicate or warty, cracked-areolate (K + yellow, CaCl + yellow); hypothallus dark. Apothecia blackish-brown, large, closely adnate, sometimes connate, the margin obtuse, undulate, becoming attenuate and obliterated in age; hypothecium thick, blackish-brown paraphyses stoutish, subdiscrete, yellowish-brown at the

tips; spores 4–8 in the ascus, elongate-ellipsoid, muriform, colourless, becoming faintly brownish, halonate, 27–30 μ long, 9–10 μ thick; hymenial gelatine deep-blue with iodine.—*Rh. conioissoideum* Hepp ex Arnold in Flora lxvii. 593 (1884) (fide Arnold). *Lecidea plicatilis* Leight. in Ann. Mag. Nat. Hist. ser. 4, iv. 201 (1869) & Lich. Fl. 351; ed. 3, 380; Cromb. in Journ. Bot. vii. 98 (1870). *L. conioissoidea* Hue in Bull. Soc. Linn. Norm. sér. 4, viii. 314 (1894).

Hue *l. c.* notes that in some specimens the thallus changes from yellow to red on the application of potash.

Hab. On alpine rocks.—*B. M.* Llyn-y-Cae, Cader Idris, Merioneth; Ben Lawers, Perthshire.

16. *Rh. rubescens* Th. Fr. Lich. Scand. 631 (1874).—Thallus thin formed of minute verrucæ, scattered or in areolæ whitish or yellowish-grey (K + deep-red, CaCl —, I —), hypothallus black generally forming a well-marked margin. Apothecia about 1 mm. wide, brownish-black, plane or somewhat convex, marginate; hypothecium brownish-black; paraphyses slender conglutinate, brownish-black towards the tips (K + olivaceous-yellow); spores 8 in the ascus, 4-septate, then muriform ovoid or ellipsoid, generally with a wide episore, 21–34 μ long, 11–16 μ thick; hymenial gelatine blue with iodine.

Differs from *L. plicatilis* and allied species chiefly in the thalline reaction with potash, but also in the determinate warted thallus. Our specimens were collected and determined by Martindale.

Hab. On rocks in upland districts.—*B. M.* Staveley and Kentmere, Westmorland.

17. *Rh. geminatum* Koerb. Syst. Lich. Germ. 259 (1855).—Thallus subeffuse, warted-areolate, the areolæ contiguous or somewhat scattered, greyish-white or -brown (K + brownish, CaCl + pale-yellowish-brown, medulla I —); hypothallus thin, black. Apothecia small, black, subsessile, plane, with a thin entire margin; hypothecium blackish-brown; paraphyses slender, dark-violet-brown at the apices; spores 1 or 2 in the ascus, ellipsoid or oblong-ellipsoid, at first colourless, becoming brownish-black, muriform, large, often broadly halonate, 40–72 μ long, 25–34 μ thick; hymenial gelatine deep-blue with iodine.—*Rh. Montagnei* Flot. ex Koerb. Syst. Lich. Germ. 258 (1855); Mudd Man. 219. *Lecidea geminata* Flot. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i, 375 (1856); Cromb. Lich. Brit. 87; Leight. Lich. Fl. 349; ed. 3, 377.

The violet colour of the epithecium is more evident after the application of potash. Spores in our specimens are mostly solitary in the ascus, but an abortive second spore may be present.

Hab. On alpine rocks.—*B. M.* Craig Guie, Braemar, Aberdeenshire.

81. **BOMBYLIOSPORA** De Not. in Massal. Ric. Lich. 114 (1852). (Pl. 15.)

Thallus crustaceous. Algal cells Protococcaceæ. Apothecia light- or dark-coloured with a proper margin only; ascus 1- (8-) spored; spores large, elongate-ellipsoid, colourless or faintly coloured, without a mucilaginous epispore (not halonate), multi-septate.

The only representative of this genus in the British Isles has a 1-spored ascus. The spermatogones have simple sterigmata and cylindrical, straight spermatia.

1. **Bombyliospora incana** A. L. Sm.—Thallus effuse, thickish, glaucous-green when wet, creamy-yellow when dry, granular-leprose (K + yellowish, CaCl —). Apothecia large, adnate, plane or tumid, reddish-brown, the margin obtuse, persistent, paler; hypothecium brownish; paraphyses slender, discrete, bright-yellowish-brown at the tips; spores elongate-ellipsoid, usually 7-10-septate, 70-160 μ long, 25-35 μ thick, hymenial gelatine yellowish, the asci reddish, with iodine.—*Lichen incanus* Ach. Lich. Suec. Prodr. 7 (1798)? Sm. Engl. Bot. t. 1683 (1807). *Lecidea incana* S. F. Gray Nat. Arr. i. 470 (1821); Hook. Fl. Scot. 38 & in Sm. Engl. Fl. v. 181, pro parte; Tayl. in Mackay Fl. Hib. ii. 126? *Biatora pachycarpa* Fr. Lich. Eur. 259 (1831). *Lecidea pachycarpa* Duf. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 364 (1856); Cromb. Lich. Brit. 75; Leight. Lich. Fl. 336; ed. 3, 361. *Bombyliospora pachycarpa* Massal. Ric. Lich. 115, fig. 226 (1852); Mudd Man. 189.

Sometimes confused with *Buellia canescens* (*Lichen incanus* Relhan non Smith) (see p. 180).

Hab. On the trunks of old trees and on shady rocks in upland wooded districts.—*Distr.* Only sparingly in a few localities of S. England, N. Wales and S. Ireland. —*B. M.* New Forest, Hants; St. Leonard's Forest, Sussex; Ulting, Essex; Cwm Bychan, Merioneth; Dinish Island, Cromaglown, Killarney and Dunkerron, Kerry.

82. **LOPADIUM** Koerb. Syst. Lich. Germ. 210 (1855). (Pl. 16.)

Thallus crustaceous. Algal cells Protococcaceæ. Apothecia light- or dark-coloured with a proper margin only; ascus normally 1-spored, sometimes 4-8-spored; spores large, ellipsoid or oblong, colourless or brownish, muriform, without a mucilaginous epispore (not halonate). Spermatogones with septate sterigmata and short straight ovate or ellipsoid spermatia.

Vainio in his Lich. Fenn. ii. 268 (1922) has included our species of *Lopadium* under *Sporopodium*, a genus established by Montagne (Ann. Sci. Nat. sér. 3, xvi. 54 (1851)) to include tropical forms on coriaceous leaves, also with muriform spores but limited to those with one spore only and differing in habitat and other particulars.

1. *L. pezizoideum* Koerb. *l. c.*—Thallus effuse, thinnish, granulose- or subsquamulose-concrescent, dark-grey or brownish (K —, CaCl —). Apothecia elevated, moderate, somewhat concave, brownish-black, the margin thin, entire, inflexed, paler; hypothecium brownish or brownish-black; paraphyses thickish, concrete, black at the apices; spores solitary, ellipsoid, brownish or dark, muriform, large, 65–110 μ long, 30–46 μ thick; hymenial gelatine not tinged, but the asci reddish-wine-coloured with iodine.—Mudd Man. 190. *Lecidea pezizoidea* Ach. Lich. Univ. 182 (1810); Cromb. Lich. Brit. 75; Leight. Lich. Fl. 348; ed. 3, 375.

A rather variable plant as to the character of the thallus and the size of the apothecia in countries where it is more common than in Great Britain. Our specimens, which are only muscicolous, represent the type as described by Acharius. In these, which are well fertile, the thallus, when wet, is more or less brownish-green. Vainio *l. c.* gives spore size as 48–135 $\mu \times$ 20–42 μ .

Hab. Incrusting mosses on rocks, rarely on earth in their crevices in alpine situations.—*Distr.* Extremely local, having been met with only on the Grampians, Scotland.—*B. M.* Craig Calliach and near the summit of Ben Lawers, Perthshire; Braemar, Aberdeenshire.

2. *L. fuscoluteum* Mudd Man. 190, t. 3, fig. 73 (1861).—Thallus effuse, granulose-verrucose, white or greyish-white (K + yellow, CaCl —). Apothecia elevated, moderate or somewhat large, at first slightly concave, then plane, sordid-orange-coloured, ochraceo-pruinose, the margin persistent, thick, inflexed, paler; hypothecium colourless or yellowish; paraphyses slender, subconcrete, tawny at the apices; epithecium granulose, K + purplish; spores solitary, colourless, ellipsoid or oblong, at times difform, 48–100 μ long, 24–55 μ thick; hymenial gelatine sordid-bluish, then, especially the asci, deep-red or tawny with iodine.—*Lichen fuscoluteus* Dicks. Pl. Crypt. ii. 18, t. 6, f. 2 (1790); Engl. Bot. t. 1007; With. Arr. ed. 3, iv. 24. *Lecidea fuscolutea* Ach. in Vet. Acad. Handl. 1808, 266; S. F. Gray Nat. Arr. i. 472; Hook. in Sm. Engl. Fl. v. 183; Cromb. Lich. Brit. 75; Leight. Lich. Fl. 351; ed. 3, 380.

Exsicc. Cromb. n. 87; Dicks. n. 25.

Hab. Incrusting decaying mosses in alpine places.—*Distr.* Rare in N. England and the Highlands of Scotland.—*B. M.* Teesdale, Durham; north side of Loch Tay, Ben Lawers and Craig Calliach, Killin, Perthshire; Ben Cruachan, Argyll.

3. *L. fecundum* Th. Fr. Lich. Arct. 202 (1860).—Thallus effuse, unequally verrucose-granulose, the granules concrete, often subfurfuraceous, brownish- or greenish-grey (K —, CaCl —). Apothecia small, sessile, appressed, black, at first concave, then somewhat plane, the margin entire, at length excluded; hypothecium brownish or reddish-brown; paraphyses slender, con-

glutinate, blackish at the apices; spores 8 in the ascus, oblong, often narrowed at one or the other end, 22-40 μ long, 10-18 μ thick; hymenial gelatine deep bluish with iodine.—*L. sociale* Koerb. Parerg. Lich. 174 (1860). *Biatora socialis* Hepp ex Koerb. l. c. *Lecidea fecunda* Nyl. ex Stiz. Lich. Helv. 171 (1882); Cromb. in Grevillea xxii. 59 (non Leight. Lich. Fl. ed. 3, 374, fide Cromb. ms.). *L. socialis* Cromb. in Journ. Bot. xx. 275 (1882).

Crombie in ms. notes has rejected Leighton's description and the specimen collected near the Wrekin, Shropshire. I have not seen the specimen.

Hab. On dead mosses among rocks in an alpine locality.—*Distr.* Very scarce on one of the S. Grampians, Scotland.—*B. M.* Summit of Craig Calliach, Perthshire.

Subseries III. GRAPHIDINEÆ.

Thallus shrubby or crustaceous, sometimes developed under the bark (hypophylæodal), often little visible or wanting. Algal cells (*gonidia*) Chlorophyceæ (*Trentepohlia* or rarely Palmellaceæ). Apothecia roundish or irregular (*ardellæ*), or linear (*lirellæ*), immarginate or with a proper margin only.

The Graphidineæ are distinguished generally by the presence of chrysogonidia (*Trentepohlia*) in the thallus, and by the form of the apothecia. There are six families represented in the British Isles :—

Thallus crustaceous, corticate on upper surface.....	XXII. DIRINACEÆ.
Thallus fruticose, strap-shaped or roundish, corticate on both surfaces.....	XXIII. ROCELLACEÆ.
Thallus crustaceous, not corticate.	
Apothecia irregularly roundish, usually marginate.....	XXIV. LECANACTIDACEÆ.
Apothecia irregularly roundish, linear or stellate, immarginate.....	XXV. ARTHONIACEÆ.
Apothecia linear, marginate.....	XXVI. GRAPHIDACEÆ.
Apothecia aggregate in stroma-like portions of the thallus.....	XXVII. CHIODECTONACEÆ.

Family XXII. DIRINACEÆ.

Thallus crustaceous, attached by hyphæ, corticate on the upper surface, the cortex of closely packed upright hyphal branches disposed at right angles to the surface (fastigiata). Algal cells *Trentepohlia*. Apothecia discoid or somewhat elongate, with proper and thalline margins; hypothecium and disc dark-coloured; spores elongate, septate. Spermatogones with simple sterigmata and acicular bent acrogenous spermatia.

A small family represented in the British Isles by a single genus and species. It is classified under Graphidineæ on account both of thalline and apothecial characters, and is nearly allied to Roccellaceæ, as was pointed out by Crombie in Monogr. i. 491 (1894).

Spores fusiform, 3-septate, colourless.....83. **Dirina**.

83. **DIRINA** Fr. Syst. Orb. Veg. 244 (1825). (Pl. 17.)

Thallus crustaceous, continuous or cracked. Apothecia discoid or somewhat irregular or elongate, subimmersed in the areolæ or superficial, with a distinct thalline margin; hypothecium thickish, black; spores 8 in the ascus, elongate-fusiform, 4-8-septate, colourless.

A maritime genus of few species but of wide distribution in warm of subtropical regions.

1. **D. repanda** Fr. l. c.; Nyl. in Mém. Soc. Sci. Nat. Cherb. ii. 313 (1854).—Thallus determinate and subeffigurate, thick, continuous or areolate, generally unequal and coarsely warted-granulate, greyish-white with a soft farinose surface and a white hypothallus (Kf + yellow, CaCl + rose-red). Apothecia moderate in size (up to 2 mm. across), at first closed then plane, black, covered generally with a white pruina, the thalline margin thick, obtuse, more or less inflexed; hypothecium thick, black; paraphyses simple, slightly widened or irregular upwards; spores fusiform, often slightly bent, 3-septate, generally about 22 μ long, 5 μ thick, but sometimes smaller or larger; hymenial gelatine wine-red with iodine.—Cromb. in Journ. Bot. ix. 178 (1871) & Monogr. i. 491, fig. 69; Leight. Lich. Fl. 235; ed. 3, 226. *Parmelia repanda* Fr. Lich. Eur. 177 (1831).

Exsicc. Johns. n. 421.

A Mediterranean plant chiefly. The apothecia are often crowded and become difform, with the margin flexuose. Spermogones are abundant.

Hab. On rocks in maritime districts.—*Distr.* Rare in the Channel Islands, S.W. England and N. Wales.—*B. M.* La Coupe and Rozel, Jersey; Portland Island, Dorset; Great Orme's Head, Carnarvonshire.

Family XXIII. ROCCELLACEÆ.

Thallus mostly fruticose, of strap-shaped or rounded branching fronds, attached to the substratum by a basal sheath, corticate, with a central medulla generally of loosely interwoven hyphæ. Algal cells *Trentepohlia*. Apothecia discoid or somewhat elongate, usually with proper and thalline margins; spores 8 in the ascus, colourless or rarely brownish, elongate, septate. Spermogones with simple or sparingly branched sterigmata and straight or curved acrogenous spermatia.

With the exception of *Roccella*, the genera of Roccellaceæ contain few species. All of them inhabit mainly the sea-coasts of warm countries. There is only one genus represented in Europe.

Thallus cylindrical or strap-shaped, branched.....84. *Roccella*.

84. **ROCCELLA** DC. Fl. Fr. ii. 334 (1805). (Pl. 18.)

Thallus fruticose of simple or branching fronds, greenish- or bluish-grey, mostly sorediate; cortex of closely packed hyphal branches disposed at right angles to the surface (fastigiate); medullary hyphæ more or less parallel with the long axis; gonidia in a zone within the cortex. Soredia, when present, in soralia. Apothecia lateral on the fronds, mostly discoid, with a proper margin, and with or without a thalline margin; hypothecium thick, black; paraphyses branched; spores elongate-oblong or fusiform, mostly 3-septate, colourless.

The species of *Roccella* have a wide distribution, but only two are found as far north as the British Isles. Some species from warm regions yield a purple dye, the orseille or orchil of commerce. *R. tinctoria*, which is not British, is the best known and was one of the earliest recorded lichens.

1. *R. fucoides* Wain. in Welw. Cat. Afric. Plants, ii. 2, 433 (1901).—Thallus of densely caespitose thickly and repeatedly branched fronds, rounded or slightly compressed, rather short (generally about 3–5 cm. high), more or less soraliate, light bluish-grey (outer cortex CaCl + orange-red, inner tissue and soredia —, medulla I + blue); basal sheath small. Apothecia small, somewhat prominent, black, without a thalline margin; paraphyses uneven, rather wider, branched and dark at the tips; spores oblong-fusiform, 3-septate, 12–16 μ long (or longer), 3–4 μ thick.—*R. phycopsis* Ach. Lich. Univ. 440 (1810); S. F. Gray Nat. Arr. i. 426; Cromb. Lich. Brit. 22 & Monogr. i. 182, fig. 37; Leight. Lich. Fl. 81; ed. 3, 74. *R. tinctoria* Hook. in Sm. Engl. Fl. v. 221 (1833) (non DC.); Mudd Man. 75 (incl. var. *phycopsis*); Leight. *ll. c. Lichen fucoides* Dicks. Pl. Crypt. fasc. ii. 22 (1790) & *L. Roccella* op. cit. fasc. iii. 19 (1793) (non Linn.); Engl. Bot. t. 211; With. Arr. ed. 3, iv. 42 (1796).

Exsicc. Cromb. n. 14; Larb. Caesar. n. 11 & Lich. Hb. n. 122; Mudd n. 48.

A rather stunted-looking bushy plant, abundantly soraliate and very rarely fertile. Spermatogones are occasionally present, with spermatia 13–16 μ long, 1 μ thick. By earlier lichenologists it was confused with *Lichen Roccella* L. Sp. Pl. 1154, the well-known dye lichen, *Roccella tinctoria* DC. Fl. Fr. ii. 334 (1805). The figure in English Botany was drawn from a specimen collected on Portland Island.

Hab. On rocks, rarely on walls, in maritime localities.—*Distr.* Uncommon on the southern coasts of the British Isles, very rare in the Clyde area, Scotland.—*B. M.* Gorey, St. Brelade's Bay, La Moye

and Noirmont, Jersey; Petit-Pot Bay, Guernsey; Sark; St. Mary's, Scilly Islands; The Lizard, Tintagel Castle, Lamorna, Pentire and St. Minver, Cornwall; Kingswear, Bolt Head, Ilfracombe, Lynmouth and Lynton, Devon; Portland Island, Dorset; Bembridge and Godshill Church, I. of Wight; Millport, Cumbrae Island, Firth of Clyde.

Form *tenuior* A. L. Sm.—Thallus of longer slender fronds much branched at the apices.—*R. phycopsis* f. *tenuior* Nyl. ex Leight. Lich. Fl. ed. 3, 74 (1879); Cromb. Monogr. i. 183. *R. fuciformis* (errore) f. *tenuior* Cromb. in Grevillea xv. 47 (1886).

Differs in the long slender fronds, almost 10 cm. high. Leighton, who first published this form, ascribed it to Larbalestier, by whom it was collected, but on the herbarium specimen Larbalestier has written f. *tenuior* Nylander, to whom it had evidently been submitted.

Hab. On rocks in a maritime situation.—*B. M.* La Moye, Jersey.

2. *R. fuciformis* DC. Fl. Fr. ii. 335 (1805).—Thallus of compressed short or long fronds narrow or wide, irregularly branched, frequently proliferate and more or less soraliolate at the margins, the soralia generally in dense groups, glaucous-white or -brownish (CaCl surface and medulla —, soredia + rose-red, medulla I + blue). Apothecia not uncommon, discoid, prominent, rather small, scattered or crowded, the disc black, at first pruinose, the thalline margin irregular in outline, at length almost excluded; paraphyses stoutish with brown tips, the whole hymenium deep brown in thick section; spores oblong-fusiform, 20–30 μ long, 4–6 μ thick.—S. F. Gray Nat. Arr. i. 426; Hook. in Sm. Engl. Fl. v. 222; Mudd Man. 76, t. 1, fig. 18; Cromb. Lich. Brit. 23 & Monogr. i. 183; Leight. Lich. Fl. 82; ed. 3, 74. *Lichenoides fuciforme tinctorium, corniculis longioribus et acutioribus* Dill. Hist. Musc. 168, tt. 22, 23, fig. 61 A–D (1741). *Lichen fuciformis* L. Sp. Pl. 1147 (1753); Dicks. Pl. Crypt. fasc. iii. 17; With. Arr. ed. 3, iv. 51; Engl. Bot. t. 728.

Exsicc. Cromb. nos. 15, 125; Larb. Cæsar. n. 12 & Lich. Hb. n. 123; Leight. n. 171.

Generally found growing with the previous species, but very distinct in form and attaining a much larger size up to 10 inches in length, with the ribbon-like fronds from less than a line to nearly half an inch in width. Only the soredia in this species are stained with chloride of lime, the outer cortex and medulla are unaffected.

Hab. On rocks in maritime districts.—*Distr.* Local though fairly plentiful on the southern coasts; rare in S.W. and W. Ireland.—*B. M.* Gorey, Beaufort Bay, St. Ouen's Bay, St. Brelade's Bay and St. Martin's, Jersey; Guernsey; St. Mary's, Scilly Islands; Logan Rocks, near Land's End, Tintagel, The Lizard, Penzance and Lamorna Cove, Cornwall; Bolt Head, Lynton and Ilfracombe, Devon.

Family XXIV. **LECANACTIDACEÆ.**

Thallus crustaceous. Algal cells, *Trentepohlia*. Apothecia roundish or oblong, immersed or sessile, immarginate or with a proper margin only; spores elongate, pluriseptate; paraphyses branched, confluent.

This order has affinities with the *Lecideæ* as well as with the *Graphidei*; to the latter it is more closely related by the algal symbionts, and by the form of the apothecia. There are two British genera:—

- Apothecia with a proper margin 85. **Lecanactis**.
 Apothecia without a proper margin..... 86. **Platygrapha**.

85. LECANACTIS Eschw. Syst. Lich. 14 (1824) emend.; Koerb. Syst. Lich. Germ. 275 (1855). *Schismatomma* Flot. & Koerb. ex Massal. Ric. Lich. 55 (1852); Mudd Man. 222. (Pl. 19.)

Thallus crustaceous. Apothecia roundish with a cupular carbonaceous proper margin; hypothecium carbonaceous; ascus clavate, 8-spored; spores fusiform or acicular, 3- or 5-septate, colourless. Spermatogones with cylindrical spermatia.

1. **L. premnea** Weddell in Mém. Soc. Sci. Nat. Cherb. xix. 295 (1875).—Thallus effuse, thin, dark-greyish or -greenish or evanescent (K —, CaCl —). Apothecia moderate in size, black, naked or dark-greenish-pruinose, with a thin prominent flexuose proper margin; hypothecium black, paraphyses lax, blackish-brown at the tips; spores oblong-fusiform, straight or slightly curved, 5-septate, 18-25 μ long, 5-7 μ thick; hymenial gelatine yellowish-red with iodine.—*Lichen abietinus* Sm. Engl. Bot. t. 1682 (1807) (non Ach.); Leight. Angioc. Lich. 66, t. 28, f. 3 (1851). *Lecidea premnea* Ach. Lich. Univ. 173 (1810); Tayl. in Mackay Fl. Hib. ii. 119; Hook. in Sm. Engl. Fl. v. 176? Cromb. Lich. Brit. 90; Leight. Lich. Fl. 337; ed. 3, 364. *Schismatomma premneum* Mudd Man. 222 (1861).

Exsicc. Bohl. n. 101 (as *Lecidea abietina*) Larb. Lich. Hb. 232; Carroll. Lich. Hib. n. 15; Leight. n. 124; Mudd n. 197.

Sometimes confused with *Biatorina premnea*, which is externally very similar, but has larger apothecia. The pruina when visible is always darker than in the following species, which is further distinguished by the size and septation of the spores. A form intersected by dark lines has been named by Crombie ms. as f. *decussata*.

Hab. On old trunks of trees. —*Distr.* Not uncommon in England and S. and W. Ireland, rare in Scotland. —*B. M.* Near Saltram, Bovey Tracey, Lustleigh and Lynnmouth, Devon; Shanklin, I. of Wight; New Forest, Hants; Broomfield, Somerset; Fletching, Hassock's Gate and Parham Park, Sussex; Penshurst, Kent; Hainault Forest, Thorndon Hall, Langford and Danbury Park, Essex; Shero, Surrey; Thame Park, Oxfordshire; near Purton, Gloucestershire;

Moccas Court and Brampton Bryan Park, Herefordshire; Norton, Worcestershire; Bradgate Park, Leicestershire; Harboro' Magna and Packington Park, Warwickshire; Nannau, Dolgelly, Merioneth; Abdon and Haughmond Hill, Shropshire; Ickworth, Suffolk; Nottinghamshire; Derbyshire; Kildale, Cleveland, Yorkshire; Castle Bernard Park, Bandon, Cork; Derryquin, Kerry; Adare Abbey, Limerick.

Var. **saxicola** A. L. Sm.—Thallus greyish-green, thin, furfuraceous. Apothecia black, sessile, greenish-pruinose or naked, otherwise as in the species. *Schismatomma premneum* var. *saxicolum* Mudd Man. 222 (1861). *Lecidea premnea* f. *saxicola* Leight. Lich. Fl. ed. 3, 365 (1879).

Exsicc. Leight. n. 185; Mudd n. 198; Larb. Lich. Hb. n. 73.

Differing mainly in the habitat. Leighton distinguishes two other saxicolous forms: *teichogena* and *crenatula* (*Lecidea premnea* f. *teichogena* Nyl. ex Leight. l. c., and f. *crenatula* Nyl. ex Leight. l. c.), both with scanty or evanescent thallus, the apothecia naked, the margin somewhat crenulate or flexuose in the latter.

Hab. On rocks, walls, &c.—*Distr.* Rare in the Channel Islands, England and W. Ireland.—*B. M.* La Moye, Jersey; Ventnor, I. of Wight; Nesscliffe, Shropshire; Airyholme Wood, Cleveland, Yorkshire; Doughruagh Mt., Kylemore, Connemara, Galway.

2. **L. abietina** Koerb. Syst. Lich. Germ. 276 (1855).—Thallus white or greyish-white, effuse, thin, furfuraceous (K —, CaCl —). Apothecia moderate in size or larger, sessile, with a thickish, prominent margin, black, but thickly whitish- or pale-yellowish-pruinose; hypothecium black; paraphyses slender, conglutinate; epithecium brownish; spores acicular-fusiform, 3-septate, 35–40 μ long, 4–6 μ thick; hymenial gelatine slightly bluish then wine-red with iodine.—*Lichen abietinus* Ach. in Vet. Acad. Handl. xvi. 139, t. 5, f. 7 (1795). *Sphæria leucocephala* Pers. Syn. Fung. Add. xxvii. (1801) (*spermogoniiferous*). *Verrucaria leucocephala* Ach. Meth. 116 (1803); Borr. in Engl. Bot. Suppl. t. 2642, f. 2. Hook. in Sm. Engl. Fl. v. 152; Tayl. in Mackay Fl. Hib. ii. 90. *Pyrenotheca leucocephala* Fr. Lich. Eur. 450 (1831); Leight. Angioc. Lich. 65, t. 28, ff. 1 & 2. *Lecidea abietina* Ach. Meth. 54 (1803); S. F. Gray Nat. Arr. i. 468; Hook. in Sm. Engl. Fl. v. 179; Cromb. Lich. Brit. 90; Leight. Lich. Fl. 330; ed. 3, 354. *Schismatomma abietinum* Massal. Ric. Lich. 56, f. 102 (1852); Mudd Man. 223.

Exsicc. Bohl. n. 115 (as *Verrucaria leucocephala*); Leight nos. 163 & 164; Mudd n. 200; Johns. n. 344.

Differs from the preceding in the dense whitish pruina covering more especially the apothecia. The spermogones (*Sphæria leucocephala*) which have rather large spermatia (12–16 μ long, 3–4 μ thick), are sometimes alone present, and resemble small whitish-grey globules. Leighton (Angioc. Lich. 66 & 67, t. 28, ff. 6 & 7) describes two somewhat similar forms: *Pyrenotheca rudis* (*Exsicc.* n. 102 as *P. vermicellifera*) and *P. aphanes* (*Verrucaria rudis* Borr. Engl. Bot. Suppl. t. 2637,

f. 2 (1830) and *V. aphanes* Borr. *tom. cit.*, t. 2642, f. 1). These are also quoted by Hooker in Sm. Engl. Fl. v. 151, who points out the affinity of *V. aphanes* with *V. leucocephala*; but the perithecia are darker in colour; the spermatia are also much smaller, about 5 μ long and 1–2 μ thick or smaller.

Hab. On trunks of trees.—*Distr.* Rather rare in S. and N. England and in S. Ireland.—*B. M.* Dartmoor, Devon; New Forest, Hants; Henfield, Sussex; Bloomfield, Somerset; Guiting Wood, Gloucestershire; Cromford, Derbyshire; Stogdale and Westerdale, Cleveland and Wheeldale, Yorkshire; Lowther Park, Westmorland; Bellingham, Northumberland; Cromaglow, Eagle's Nest and Cloghan, Killarney, Kerry.

Form *incrustans* Oliv. Exp. Syst. Lich. ii. 1. 46 (1900).—Thallus greyish, thicker than in the species.—*Cyphelium incrustans* Ach. in Vet. Acad. Handl. 1817, 230, t. 8, f. 6. *Lecidea abietina* f. *incrustans* Nyl. Lich. Scand. 241 (1861); var. *incrustans* Cromb. in Journ. Bot. xx. 275 (1882).

Hab. Incrusting mosses and hepatics on rocks.—*Distr.* Rare in S. England.—*B. M.* Near Eridge, Sussex.

3. *L. illecebrosa* Fr. Syst. Orb. Veg. 288 (1825); Koerb. Syst. Lich. Germ. 277.—Thallus effuse, thin, pulverulent or subgranulose, white (K —, CaCl —). Apothecia small, black, plane and thinly margined, at length convex and immarginate, white-pruinose, black within; hypothecium brownish-black; paraphyses concrete; spores fusiform, 1–5-septate; 16–21 μ long, 3–4 μ thick; hymenial gelatine tawny-wine-reddish with iodine.—*Lichen amylaceus* Ehrh. [Fl. Crypt. n. 303 (1793), nomen: *Opegrapha illecebrosa* Duf. in Journ. Phys. lxxxvii. 213 (1818) (fide Fries). *Schismatomma amylaceum* Massal. Ric. Lich. 56, f. 103 (1852); Mudd Man. 222. *Lecidea amylacea* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 383 (1856). *L. corticola* var. *farinosa* Ach. Lich. Univ. 187 (1810). *L. farinosa* Cromb. Lich. Brit. 90 (1870) (excl. subsp.); Leight. Lich. Fl. 340; ed. 3, 365.

Hab. On old trunks of trees.—*Distr.* Rare in S. and N. England.—*B. M.* Bramble Hill, New Forest, Hants; Lowther Park, Westmorland.

4. *L. Dilleniana* Koerb. Syst. Lich. Germ. 276 (1855).—Thallus effuse, thinnish, soft, granular-areolate, verrucose or wrinkled, greyish-white often somewhat white-pruinose (K + yellowish, CaCl + orange-yellow). Apothecia rather small, black, appressed, sessile, plane, marginate, white-pruinose or naked, the margin thin, entire, or flexuose; hypothecium blackish-brown; paraphyses slender, coherent; epithecium brownish; spores narrowly fusiform, 3-septate, 23–32 μ long, 5–6 μ thick; hymenial gelatine pale-bluish then tawny-wine-red with iodine.—*Lichen Dillenianus* Ach. Lich. Suec. Prodr. 57, t. 1, f. 1 (1798). *L. candidus* Sm. Engl. Bot. t. 1138 (1803)? (see also p. 149). *Lecidea*

Dilleniana Ach. Meth. 55 (1803); Leight. Lich. Fl. 332, ed. 3, 352 & in Grevillea ii. 172, t. 26, f. 1. *L. farinosa* subsp. *Dilleniana* Cromb. Lich. Brit. 90 (1870). *Schismatomma amylaceum* var. *candidum* Mudd Man. 222, t. 4, f. 84 (1861).

Exsicc. Mudd n. 199; Leight. n. 336 (as *Lecidea amylacea*).

As noted above, the *Lichen candidus* of Engl. Bot. was quoted at p. 137 on Leighton's authority as the original of his *Lecidea Turneri*, and though no spores are to be found in the British Museum specimen it seems more probable that it belongs here; Leighton had already quoted it as synonymous with his published specimen, *Lecidea amylacea* n. 336.

Hab. On maritime and subalpine rocks.—*Distr.* Rather rare in E. and N. England and the Grampians, Scotland.—*B. M.* Ingleby Park, Cleveland, Yorkshire; Kentmere, Mallerstang and Staveley, Westmorland; the Trossachs, Perthshire; Achallater, Braemar, Aberdeenshire.

5. *L. mirifica* A. L. Sm.—Thallus whitish or greyish, rather thick, minutely cracked, sometimes granulose or farinose (K —, K(CaCl) + reddish). Apothecia black, moderate in size, sessile, round (not oblong), scattered or crowded; disc generally densely grey-pruinose, at first rather concave and acutely margined, becoming plane or convex and immarginate; hypothecium blackish or brownish-black; paraphyses irregular, branched and entangled, the apices clavate-capitate with a dark-brown line across the tips; spores 8, colourless, oblong or obtusely fusiform, 3-septate, 14–21 μ long, 3.5–4.5 μ thick; hymenial gelatine wine-red with iodine.—*Opegrapha mirifica* Stirton in Scott. Nat. 1879, 17; Leight. Lich. Fl. ed. 3, 545; A. L. Sm. Monogr. Part 2, 238 (1911).

Considered by Stirton to be nearly allied to *Opegrapha grumulosa*; its place is evidently here under *Lecanactis* near to *L. Dilleniana*.

Hab. On rocks.—*B. M.* Millport, I. of Cumbrae.

6. *L. delimis* A. L. Sm.—Thallus dark-greyish, warted-granular or wrinkled, scattered (K + yellow, CaCl + red); hypothallus dark brown, limiting the thallus. Apothecia small, black, convex, thinly marginate or immarginate, greyish-pruinose; hypothecium thick, black; paraphyses subdiscrete; epithecium granular, dark in thick section; spores linear-oblong or somewhat fusiform, 3-septate, slightly constricted at the septa, 15–18 μ long, 4–5 μ thick or longer and narrower, 21–23 μ long, 3 μ thick; hymenial gelatine tawny-wine-coloured or reddish with iodine.—*Lecidea delimis* Nyl. in Flora lvi. 297 (1873); Cromb. in Journ. Bot. xii. 149 (1874); Leight. Lich. Fl. ed. 3, 351.

Hab. On rocks.—*B. M.* Mount Orgueil, Jersey.

86. **PLATYGRAPHA** Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. 188 (1855). (Pl. 20.)

Thallus scanty or evanescent. Apothecia roundish or oblong,

simple or rarely branched, immarginate, but with a spurious thalline margin, blackish; spores 8 in the ascus, fusiform, septate, colourless; paraphyses slender, more or less discrete. Spermatogones with shortly cylindrical straight or slightly arcuate spermatia.

The genus is almost entirely exotic, but of the four known European species, two occur very sparingly in Great Britain.

1. *P. periclea* Nyl. l. c. & in Act. Soc. Linn. Bord. sér. 3, i. 408 (1856).—Thallus effuse, scanty, very thin, subleprose, white or whitish. Apothecia depressed, roundish or oblong, at times somewhat difform, black, opaque, concolorous within, the thalline margin at length subevanescent: spores narrowly fusiform, 3-septate, often curved, 30–42 μ long, 3–4 μ thick; hymenial gelatine bluish then wine-red with iodine.—Martind. in Naturalist, 1886, 49. *Lichen pericleus* Ach. Lich. Suec. Prodr. 78 (1798).

Like other species of the genus, this might in some states readily be taken for a species of Lecanoraceæ: Acharius subsequently referred it to *Lecanora* (*Rinodina*) *exigua* (Lich. Univ. 355); the name *periclea* has since been assigned to *Rinodina exigua* by several British authors (cf. Part I. 351). The spermatogones have been described as *Pyrenotheca stictica* Fr. in Vet. Ak. Handl. 1821, 334.

Hab. On the trunks of old oaks and firs in upland tracts of mountainous districts.—*Distr.* Only very sparingly in N.W. England (near Kendal, Westmorland) and the N. Grampians, Scotland; no doubt to be detected elsewhere.—*B. M.* Lowther Park, Kendal, Westmorland; near Old Mar Lodge, Braemar, Aberdeenshire.

2. *P. rimata* Nyl. ll. c.—Thallus effuse, thin, warted and cracked, whitish. Apothecia impressed in the verrucæ, simple or divided, variously difform, plane or slightly convex, unequal, blackish, somewhat shining, with a narrow spurious thalline margin; hypothecium thick, brownish-black; spores narrowly fusiform, 3-septate, more or less curved, 24–34 μ long, about 3–4 μ thick; hymenial gelatine bluish then wine-reddish with iodine. Mudd Man. 244, t. 4, f. 95; Cromb. Lich. Brit. 101; Leight. Lich. Fl. 388; ed. 3, 411. *Schismatomma dolosum* var. *rimatum* Flot. Lich. Exs. n. 438b (1829) fide Nyl. in Act. Soc. Linn. Bord. l. c. *Chiodecton graphidioides* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 395, t. 7, f. 29 (1854).

Differs from the preceding in the verruculose thallus. The verrucæ are somewhat large, prominent, aggregate and wrinkled. The apothecia, which are usually one in each verruca, are rather variable in size and form, being sometimes linear and slightly branched. In the very few British specimens seen the spermatogones, rarely present, have the spermatia somewhat arcuate, 4–5 μ long.

Hab. On trunks of trees, ash and elm, in upland wooded situations.—*Distr.* Local and scarce in W. England, N. Wales and Ireland (Loughlinstown, Dublin). *B. M.* Near Sharpstones Hill, Shropshire; Chirk Castle Park, Denbighshire.

Family XXV. ARTHONIACEÆ.

Thallus crustaceous, thin, often developed under the bark (hypophlœodal), evanescent or wanting. Apothecia roundish or difform (*ardellæ*) or elongate (*lirellæ*); ascus short, pyriform; spores 4 to 8 in the ascus, septate or muriform; paraphyses branched, confluent; spermogones with simple sterigmata and ovate, cylindrical, or slender spermatia.

The order is throughout distinguished by the immarginate apothecia which often resemble a small spot or stain on the bark, and by the short pyriform asci. It is represented in Britain by two genera :—

- | | |
|-----------------------------------|--------------------------|
| Spores 1- or pluri-septate | 87. Arthonia. |
| Spores septate and muriform | 88. Arthothelium. |

87. **ARTHONIA** Ach. in Schrad. Neu. Journ. Bot. i. 3, 3 (1806) emend. & Lich. Univ. 25 (1810). (Pl. 21.)

Thallus crustaceous, thin or evanescent, sometimes developed, under the bark (hypophlœodal). Algal cells *Trentepohlia* or more rarely *Palmellaceæ*. Apothecia innate, sessile, immarginate, roundish (*ardellæ*) or elongate (*lirellæ*), plane or tumid; paraphyses much-branched, involved in mucilage; asci pyriform or almost globose, rarely elliptical, thickened at the apices; spores elongate-ovate or clavate, 1- or pluri-septate, colourless or sometimes brownish.

Includes a number of species that have been formerly classified under different genera, according to the form of the thallus or spores; they are grouped in three sections :—

Thallus with *Trentepohlia* gonidia.

Apothecia more or less brightly

coloured or brown § i. CONIOCARPON (1-6).

Apothecia blackish § ii. EUARTHONIA (7-20).

Thallus with *Palmella* gonidia, or

wanting § iii. LECIDEOPSIS (21-28).

§ i. CONIOCARPON A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, 91 (1903).—*Coniocarpon* DC. Fl. Fr. ii. 323 (1805), pro parte; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 443 (1854).

Algal cells *Trentepohlia*. Apothecia brightly coloured or brown, not black; spores 1- or more-septate.

Spores 1-septate.

1. **A. lurida** Ach. Lich. Univ. 143 (1810).—Thallus thin, pale-dirty-brown or pale-lead-coloured, smooth, effuse or obsolete. Apothecia (*ardellæ*) reddish or reddish-black, generally numerous, sessile, appressed, irregularly roundish, slightly convex (K +

violet or blue); spores broadly ovate, 1-septate, colourless or pale-yellow, 10–15 μ long, 4–6 μ thick; hymenial gelatine dirty-wine-red with iodine.—Borr. Engl. Bot. Suppl. t. 2692, fig. 2; Hook. in Sm. Engl. Fl. v. 143; Tayl. in Mackay Fl. Hib. ii. 104; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 442, t. 8, fig. 38 (1854) & Lich. Fl. 391; ed. 3, 414; Mudd Man. 250; Cromb. Lich. Brit. 102 (excl. f. *vinosa*). *Lecidea emphyssa* Stirton in Grevillea iii. 33, 79, 117 (1874).

Exsicc. Mudd n. 236; Leight. n. 224 (as *A. vinosa*).

Hab. Usually on the trunks of small trees. *Distr.* Frequent in England, somewhat rare in the Channel Islands, W. Scotland and in S. Ireland.—*B. M.* Withiel, Cornwall; Balcombe, Blackdown, Handcross and Hurstpierpoint, Sussex; near Becky Falls and Newton Bushel, Devon; New Forest, Hampshire; Gopsall, Leicestershire; Bettws-y-Coed and Trefriw, Carnarvonshire; Sutton, near Shrewsbury, Shropshire; Malvern, Worcestershire; Oggeray Gill, Baysdale and Airyholme Wood, Cleveland, Yorkshire; Windermere, Westmorland; Barcaldine, Argyll; Mangerton and Dunkerron, Kerry.

Var. *spadicea* Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. 92 (1856).—Differs from the species in the somewhat darker apothecia and in the shorter unequally divided spores, 11–12 μ long, 4–5 μ thick, the lower cell being frequently elongate, bi-guttulate and spuriously divided.—Mudd Man. 251. Subsp. *spadicea* Cromb. Lich. Brit. 103 (1870). *Arthonia spadicea* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 442, t. 8, fig. 39 (1854) & Lich. Fl. 393; ed. 3, 417.

Exsicc. Leight. n. 97.

Hab. On the trunks of trees, mostly in shady woods.—*Distr.* Rare in the Channel Islands, England and S. Ireland. *B. M.* Jersey; Lustleigh, Devon; Broomfield, Somerset; Lyndhurst, New Forest, Hants; Midhurst and near Eridge, Sussex; Hockley Woods, Essex; Chedworth Woods, Gloucestershire; by the Wye, near Monmouth; Gopsall, Leicestershire; Barmouth and Dolgelly, Merioneth; Bettws-y-Coed, Carnarvonshire; Shelton Rough, near Shrewsbury, Shropshire; Dovedale, Derbyshire; Ayton, Yorkshire; Glenbower Wood and Enniskean, Cork; Muckcross and Eagle's Nest, Killarney, Kerry; Achill Island, Mayo.

2. *A. didyma* Koerb. in Schles. Ges. Denkschr. Breslau 1853, 235, emend.; Almqu. in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, 13 (1880).—Thallus thin, effuse, smooth or furfuraceous, whitish, or pale-brown. Apothecia small, crowded, irregularly angular or roundish, deep vinous-red or blackish, vinous-red within (K + violet or blue); spores obovate, colourless, becoming brownish, 1-septate, 15–18 μ long, 6–8 μ thick; hymenial gelatine greenish then blue with iodine.—*A. pineti* Koerb. Syst. Lich. Germ. 292 (1855); Carroll in Journ. Bot. iv. 24 (1866); Cromb. Lich. Brit. 104. *A. vinosa* Leight. in Ann. Mag. Nat. Hist. ser. 2, xviii. 331 (1856) & Lich. Fl. 391; ed. 3, 414 (incl. var.

pineti Leight.); Mudd Man. 250. *A. lurida* f. *vinosa* Cromb. Lich. Brit. 103 (1870).

Exsicc. Mudd n. 235.

Intimately related to *A. lurida*, but differing in the paler thallus, the somewhat larger spores, and in the reaction of the hymenial gelatine with iodine. Leighton's specimen (n. 224), as noted by Almquist (*l. c.*), belongs to the preceding species.

Hab. On the bark of trees.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Lustleigh Cleave, Devon; New Forest, Hants; Danbury, Essex; Brandon Forest, Wilts; Ulchin Wood, Norton, Worcester; Builth, Breconshire; Dolgelly, Merioneth; Church Stretton, Shropshire; Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Stogdale, Cleveland, Yorkshire; Barcaldine, Argyll; Aberfeldy, Perthshire; Castle Bernard and Enniskean, Cork; Clonmel, Tipperary.

3. *A. atrofuscella* Nyl. in Flora, lviii. 363 (1875).—Thallus whitish-glaucous, smooth. Apothecia minute, punctiform, reddish-black (K + violet); spores obovate, 1-septate, colourless, becoming brownish, 12–16 μ long, 5–6 μ thick.—Leight. Lich. Fl. ed. 3, 415.

Exsicc. Larb. Lich. Hb. n. 193.

Very similar to the last species, but with smaller apothecia and spores.

Hab. On trees, rare.—*B. M.* Doughruagh Mt., Connemara, Galway (the only locality).

Spores 3-4-septate, upper cell largest.

4. *A. gregaria* Koerb. Syst. Lich. Germ. 291 (1855).—Thallus determinate, often developed under the bark (hypophlœodal), greyish or reddish, thin, filmy, sometimes furfuraceous. Apothecia irregularly roundish or elongate, scattered or confluent, the disc plane, depressed, somewhat whitish- or cinnabar-red-pruinose or naked (K + violet); spores obovate-clavate, usually 4-septate, the upper cell largest, colourless or faintly yellowish-red, 18–26 μ long, 7–9 μ thick; hymenial gelatine blue with iodine.—Mudd Man. 249. *A. cinnabarina* Wallr. Crypt. Germ. i. 320 (1831); Cromb. Lich. Brit. 102; Leight. Lich. Fl. 398; ed. 3, 421. *Sphæria gregaria* Weigel Obs. Bot. 43, t. 2, fig. 10 (1772). Dicks. Pl. Crypt. i. 22 (1785); With. Arr. ed. 3, iv. 391; Sow. Engl. Fung. iii. t. 375, f. 5. *Lichen impolitus* Sm. Engl. Bot. t. 981 (1802)? *Spiloma* (?) *tumidula* Ach. Meth. 11, t. 1, fig. 5 (1803) and *S. tumidulum* Ach. Lich. Univ. 136 (1810); Engl. Bot. t. 2151; Hook. Fl. Scot. ii. 35; S. F. Gray Nat. Arr. i. 480. *S. gregarium* Turn. & Borr. Lich. Brit. 42 (1839); Hook. in Sm. Engl. Fl. v. 167 pro parte; Tayl. in Mackay Fl. Hib. ii. 77 pro parte. *Coniocarpon cinnabarinum* DC. Fl. Franc. ii. 323 (1805); Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 443, t. 8, f. 40 (1854).

Well distinguished by the form and septation of the spores and also frequently by the red coloration, which is more or less apparent on thallus or apothecia, becoming more pronounced in var. *kermesina* and disappearing in vars. *pruinata* and *anerythrea*. The thallus is usually suborbicular in outline and often limited by a rather broad dark line. Salwey (Penzance Nat. Hist. Soc. 1853, 142) notes that species of "*Spiloma*" are rare in moist localities.

Hab. On the bark of trees.—*Distr.* Frequent in England and Ireland.—*B. M.* S. Devon; Hassock's Gate, Crawley; Fairlight, Hurstpierpoint, Glynde, and Balcombe, Sussex; Reigate, Surrey; Oakley Park, Cirencester, Gloucestershire; Menstre, Lyndhurst and Malley, New Forest, Hants; Gopsall, Leicestershire; Fordon, near Welshpool, Montgomeryshire; Patcham, Worcestershire; Cliffrigg and near Stokesley, Cleveland, Yorkshire; Windermere, Westmorland; Muckross Demesne and Deer Park, Killarney, Kerry; Adare and near Limerick; Glenstale, Tipperary; Dromoland, Clare; Ballyedmond Glen, Cork; Louisburgh, Mayo.

Var. *astroidea* Mudd Man. 250 (1861), emend.—Thallus usually thin, smooth or minutely cracked, whitish or tinged with purple. Apothecia subimmersed, depressed, confluent in radiate or stellate groups, naked or often vermilion-powdered at the margins.—*Coniocarpon cinnabarinum* var. *astroideum* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 445 (1854) pro parte. *Arthonia cinnabarina* var. *anerythrea* f. *astroidea* Leight. Lich. Fl. 400 (1871); ed. 3, 423; var. *kermesina* f. *marginata* Leight. *ll. c.* pro parte; var. *opegraphina* Leight. in Grevillea i. 59, t. 4, f. 7 (1872) & Lich. Fl. ed. 3, 423. *A. radiata* var. *opegraphina* Ach. Lich. Univ. 669 (1810). *A. astroidea* var. *opegraphina* Ach. Syn. 6 (1814); Cromb. Lich. Brit. 103; var. *epipastoides* Leight. *ll. c.* (non Nyl.).

Exsicc. Mudd nos. 233 (as var. *marginata*), 234.

Perhaps only a growth form. The narrow edge of bright red granules round the areolæ is very striking in nearly all the specimens.

Hab. On trees.—*Distr.* Somewhat rare in S. and N. England and S. Ireland.—*B. M.* Withiel and St. Breock, Cornwall; New Forest, Hants; Oakley Park, Cirencester, Gloucestershire; Trefriw, Carnarvonshire; Airyholme and Ayton, Cleveland, Yorkshire.

Form *cuspidans* A. L. Sm.—Thallus as in the variety. Apothecia elongate, slender, the ends pointed, scarcely tinged with red; spores rather smaller, 16–19 μ long, 5–7 μ thick.—*Arthonia cinnabarina* f. *cuspidans* Nyl. in Flora lix. 310 (1876); Cromb. in Grevillea v. 30; Leight. Lich. Fl. ed. 3, 423.

Exsicc. Larb. Lich. Hb. n. 235.

Hab. On trees.—*Distr.* Rare in S. and W. Ireland.—*B. M.* Cromaglow, Killarney and Glencar, Kerry; Doughruagh Mt. and Derryclare, Connemara, Galway.

Var. *kermesina* A. L. Sm.—Thallus whitish or tinged red or purple. Apothecia usually convex, powdery, more or less

vermilion-coloured.—Vars. *cinnabarina*, *rosacea*, *marginata*, *detrita* and *dubia* Mudd Man. 249 (*Spiloma gregarium* vars. Turn. & Borr. l. c.). *Lichenoides leprosum tuberculis fuscis et ferrugineis* Dill. Hist. Musc. 126, t. 18, f. 4 pro parte (1741). *Coniocarpon cinnabarinum* vars. Leight. l. c. *A. cinnabarina* var. *kermesina* Nyl. Lich. Scand. 257 (1861); Cromb. Lich. Brit. 102; Leight. Lich. Fl. 399; ed. 3, 422, incl. ff. *cinnabarina*, *rosacea*, *detrita* and *dubia*. *Spiloma tumidulum* Sm. Engl. Bot. t. 2151 (1810) (non Ach.?). *Leptra kermesina* Schær. Enum. 240 (1850).

Exsicc. Leight. nos. 249, 250.

Differs from the type in the marked vermilion or purple colour. The thallus varies from whitish to a deep purple; the apothecia are usually a deep red, and occasionally thallus or apothecia somewhat whitish-pruinose.

Hab. On trunks of trees.—*Distr.* More or less common throughout the British Isles.—*B. M.* Rozel, Jersey, St. Breock, Cornwall; near Becky Falls, near Lustleigh and Torquay, Devon; New Forest, Hants; Hastings and Ardingly, Sussex; Chalkney Woods, Gosfield Hall and Epping Forest, Essex; Chedworth Woods and Chalford, Gloucestershire; Colwall Copse, Herefordshire; Twycross, Leicestershire; Hay Park, Ludlow, Shropshire; Forden, Montgomeryshire; King's Wood, Airyholme Wood, Ingleby Park and near Ayton, Cleveland, Yorkshire; Nannau, Dolgelly, Merioneth; Falls of Clyde, Lanarkshire; Barcaldine, Argyll; Dunkeld, Perthshire; Old Dromore and Cromaglow, Killarney, Kerry; Dromoland, Clare; Adaro, Limerick; Shane's Castle, Antrim.

Var. *pruinata* A. L. Sm.—Thallus whitish, sometimes furfuraceous, often tinged with purple. Apothecia blackish, covered with a white pruina.—Vars. *concolor* and *microstigma* Mudd Man. 249 & 250 (1861). *Spiloma gregarium* vars. *concolor* and *microstigma* Turn. & Borr. l. c. *Coniocarpon cinnabarinum* vars. *concolor* and *microstigma* Leight. l. c. *Arthonia cinnabarina* var. *pruinata* Del. ex Nyl. Lich. Scand. 257 (1861); Cromb. Lich. Brit. 102; Leight. Lich. Fl. 399; ed. 3, 422 incl. ff. *concolor* and *microstigma*.

Exsicc. Leight. n. 251.

The white powdery apothecia are often arranged in a radiatellate form, sometimes they are solitary and depressed (var. *microstigma*); when the thallus also is white suffused it is var. *concolor*.

Hab. On trees in S. and N. England and in S.W. Ireland.—*B. M.* Shanklin, I. of Wight; near Becky Falls, Devon; near Lyndhurst, New Forest, Hants; St. Leonard's Forest, Sussex; near Dorking, Surrey; Twycross, Leicestershire; Eashy Wood, Airyholme Wood and Kildale, Cleveland, Yorkshire; Eagle's Nest, Killarney, Kerry.

Var. *anerythrea* A. L. Sm.—Thallus whitish. Apothecia brownish-black, prominent, naked.—*Arthonia cinnabarina* var. *anerythrea* Nyl. l. c.; Cromb. Lich. Brit. 102; Leight. Lich. Fl. 400; ed. 3, 423.

Distinguished by the round prominent apothecia without any pruina.

Hab. On trees.—*Distr.* Rare in S. England and in S. and W. Ireland.—*B. M.* Near Becky Falls, Devon; near Lyndhurst, New Forest, Hants; Castle Bernard and Crosshaven, Cork; Glencar and Turk Mt., Killarney, Kerry; Doughruagh Mt., Connemara, Galway.

5. *A. astroidestera* Nyl. in Flora Ivii. 13 (1874).—Thallus white or cream-coloured, thin, smooth. Apothecia dark-brown, innate, slender, elongate, radiate or stellate: spores 3–5-septate (usually 4-septate), colourless, 21–26 μ long, 7–8 μ thick; hymenial gelatine blue with iodine.—Cromb. in Journ. Bot. xii. 149 (1874); Leight. Lich. Fl. ed. 3, 424. *A. punctiformis* Mudd Man. 247 (1861) pro parte (non Ach.) *A. armoricana* Cromb. Lich. Brit. 103 (1870) (non Nyl.); Leight. Lich. Fl. 401.

The specimens collected by Larbalestier and Crombie, now in the British Museum, have 4-celled spores, the upper cell being larger than the others, and resembling the spores of *A. gregaria*; the apothecia are partly white-suffused, and have not the red-colouring matter usually to be found in that species. Mudd describes the spores of his *A. punctiformis* as 3-septate, the upper cell largest.

Hab. On holly or beech.—*Distr.* Rare in S. England and S. Ireland.—*B. M.* Lyndhurst and Brockenhurst, New Forest, Hants.

6. *A. elegans* Ach. Lich. Univ. 135, t. 1, fig. 1 (1810) emend.; Almqvist in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, 19.—Thallus whitish, thin. Apothecia dark reddish-brown, ochraceous-pruinose, roundish or somewhat difform (K + crimson); spores obovate, 3-septate, upper cell largest, 15–18 μ long, 7–8 μ thick.—*A. ochracea* Duf. in Journ. Phys. lxxxvii. 205 (1818); Carroll in Journ. Bot. iii. 291 (1865); Cromb. Lich. Brit. 102; Leight. Lich. Fl. 394; ed. 3, 418.

Differs from *A. gregaria* in the apothecia and in the smaller spores. Almqvist fails to note that the spores as figured by Massalongo (*Coniocarpon ochraceum* Ric. Lich. 47, f. 83) have the upper cell largest, as in *A. gregaria*; in the specimen from Glencar they correspond with Massalongo's figure, and measure 15–17 μ long and 3–6 μ thick.

Hab. On trees.—*Distr.* Rare in Wales and S. Ireland.—*B. M.* Glencar, Kerry.

§ ii. EUARTHONIA A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, 90 (1903).

Algal cells *Trentepohlia*. Apothecia blackish; spores 1- or more-septate.

Spores 1-septate.

7. *A. aspersella* Leight. in Grevillea i. 60, t. 4, f. 4 (1872).—Thallus in patches, effuse, pale yellowish. Apothecia very minute, scattered, punctiform, linear, angular, sometimes confluent, blackish-brown, hymenium K —; spores obovate, colourless, 1-septate, 11–15 μ long, 5–6 μ broad.—Leight. Lich. Fl. ed.

3, 415. *A. sapineti* Nyl. in Flora lix. 239 (1876); Cromb. in Grevillea v. 30; Leight. l. c.

Somewhat similar to *A. didyma*, but differs in the darker-coloured, angular apothecia, the somewhat smaller spores, and in the hymenial reaction with potash.

Hab. On holly.—*Distr.* Rare in Wales and Ireland.—*B. M.* Capel Arthog, Merioneth; Gwydir Woods, Bettws-y-Coed and Trefriw, Carnarvonshire; Killary Bay, Connemara, Galway.

8. *A. galactites* Duf. in Journ. Phys. lxxxvii. 203 (1818).—Thallus white, thin, smooth. Apothecia small, dark-brown, punctiform, round or oblong; spores colourless, ovate-oblong, 1-septate, 12–14 μ long, 4 μ thick; hymenial gelatine blue then sordid-wine-red with iodine.—*A. punctiformis* var. *galactina* (errore pro *galactites*) Ach. Lich. Univ. 141 (1810); *Verrucaria galactites* DC. Fl. Franc. v. 315 (1805).

Distinguished by the white thallus. The spores are rather broad above, the lower cell tapering downwards. Owing to the absence of gonidia from the superficial thallus this species has been classified among fungi as *Lecidiopsis galactites* Rehm (Rabenh. Krypt. Fl. i. 3, 433 (1891)). There is some evidence that gonidia are present below the bark, or they may disappear as the plant reaches maturity.

Hab. On trees.—*Distr.* Rare in S. and N. England.—*B. M.* Torquay, Devon; Lymington, Hants; Sussex; Hatfield Peverel, Essex; near Ayton, Cleveland, Yorkshire.

9. *A. dispersa* Nyl. Lich. Scand. 261 (1861).—Thallus forming pale spots, limited but without a dark outline. Apothecia small, slender, somewhat elongate, irregular and flexuose; epithecium dark-brown; spores rather small, ovate-oblong, 1-septate, the upper cell somewhat broader, 10–13 μ long, 4–5 μ thick; hymenial gelatine blue then violet-coloured with iodine.—*Opegrapha dispersa* Schrad. in Ust. Ann. Bot. xxii. 86 (1797) fide Nyl. *Lichen epipastus* Ach. Prodr. 23 (1798).

Hab. On bark of trees.—*Distr.* Rare in S. England.—*B. M.* New Forest, Hants; Handcross, Sussex.

10. *A. excipienda* Cromb. Lich. Brit. 104 (1871).—Thallus greyish or whitish, determinate. Apothecia slender, elongate punctiform or irregular; spores colourless, obovate, 1-septate, 14–21 μ long, 5–9 μ thick; hymenial gelatine wine-red with iodine.—Leight. Lich. Fl. 393; ed. 3, 416. *A. dispersa* subsp. *excipienda* Nyl. Lich. Scand. 261 (1861). *A. hibernica* Nyl. in Flora lix. 237 (1876); Cromb. in Grevillea v. 28; Leight. Lich. Fl. ed. 3, 418.

Exsicc. Larb. Lich. Hb. n. 194 (as *A. hibernica*).

Perhaps only a subspecies of the preceding, but distinguished by the constantly larger spores and the different reaction with iodine.

B. de Lesdain has published *A. hibernica* var. *stellulata* from the Haute Garonne in Bull. Soc. Bot. Fr. lviii. 239 (1910). It is distinguished by the smaller difform-stellate apothecia.

Hab. On bark of trees.—*Distr.* Rare in Central Scotland and in S. and W. Ireland.—*B. M.* Killin, Perthshire; Mangerton, Kerry; Killary Bay and near Leenane and Cleghan, Connemara, Galway.

11. *A. punctilliformis* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 146, t. 22, figs. 26–28 (1876).—Thallus a mere film. Apothecia scattered, blackish-brown, very minute, irregularly roundish, convex, internally brown; spores oblong-clavate, pale-brownish, 1-septate, large, $29\ \mu$ long, $13\ \mu$ thick.—Leight. in Grevillea iii. 113 & Lich. Fl. ed. 3, 417; Cromb. in Journ. Bot. xiii. 141 (1875).

Hab. On holly.—*Distr.* Very rare in N. Wales.—*B. M.* Trefriw, Carnarvonshire.

Spores 3–6-septate, upper cell largest.

12. *A. aspersa* Leight. in Ann. Mag. Nat. Hist. ser. 2, xviii. 332, t. 11, figs. 11–15 (1856).—Thallus thin, smooth, indeterminate, greyish-green. Apothecia small, roundish or irregular or substellate, the disc black, flattened or somewhat convex; spores obovate, 3-septate, colourless or pale-yellowish, the upper cell largest, $13\text{--}15\ \mu$ long, $4\text{--}6\ \mu$ thick; hymenial gelatine bluish with iodine.—Mudd Man. 248, t. 4, f. 97; Cromb. Lich. Brit. 102; Leight. Lich. Fl. 395; ed. 3, 418.

Exsicc. Leight. n. 248.

Differs from *A. radiata* in the less stellate apothecia, and in the septation and size of the spores.

Hab. On bark of holly.—*Distr.* Rare in England and S. Ireland.—*B. M.* Becky Falls, Devon; Barmouth, Merioneth; Pontesbury, Shropshire; Baysdale, Cleveland and Farndale, Yorkshire; Wark-on-Tyne, Northumberland; Dinish, Killarney, Kerry.

13. *A. arthonioides* A. L. Sm.—Thallus rather thick, cream-coloured slightly tinged with rose, effuse, smooth becoming pulverulent. Apothecia small, numerous, solitary or rarely confluent, rounded, somewhat convex, immarginate, the disc rough and pulverulent when old; spores 6–8 in the ascus, linear-clavate, 3-septate, the upper cell slightly larger, $13\text{--}16\ \mu$ long, $6\text{--}7\ \mu$ thick; hymenial gelatine yellowish-red with iodine.—*A. trachylioides* Nyl. in Mém. Soc. Sci. Nat. (herb. iv. 99 (1856); Mudd Man. 251, t. 4, f. 98; Cromb. Lich. Brit. 104; Leight. Lich. Fl. 398; ed. 3, 421. *Lecidea arthonioides* Ach. Lich. Univ. 178 (1810).

Exsicc. Johns. n. 513 (as *A. myriocarpella*); Mudd n. 237.

Hab. On rocks.—*Distr.* Rare in upland or mountainous districts.—*B. M.* Great Orme's Head, Carnarvonshire; Ingleby and Higheliff, Cleveland, Yorkshire; Wark-on-Tyne, Northumberland.

14. *A. dendritica* A. L. Sm.—Thallus whitish or greyish, effuse, tartareous, rather thick in places, smooth. Apothecia black, innate, roundish or somewhat elongate and irregularly radiate, contiguous and confluent or solitary, plane, internally pale; asci pyriform; spores obovate, or clavate, colourless, 2–4-septate, upper cell largest, 17–22 μ long, 5–7 μ thick.—*Stigmatidium dendriticum* Leight. in Journ. Bot. xiii. 257, t. 166 (1875) & Lich. Fl. ed. 3, 413.

Exsicc. Larb. Lich. Hb. n. 192.

Resembles *Enterographa* in the character of the thallus, but is separated from that genus by the character of the apothecia and by the form and structure of asci and spores.

Hab. On rocks.—*Distr.* Very rare in W. Ireland.—*B. M.* Tully and Doughruagh Mt., Connemara, Galway (the only localities).

15. *A. ilicina* Tayl. in Mackay Fl. Hib. ii. 105 (1836).—Thallus cream-coloured, thin, smooth, shining, limited by a brownish border varying in width. Apothecia small, scattered, subimmersed, irregularly round or oblong, blackish-brown, plane; spores colourless or pale yellow, obovate-clavate, 6-septate, the upper cell largest, 21–36 μ long, 9–12 μ thick; hymenial gelatine blue, the asci yellowish or wine-red, with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 441, t. 8, f. 36 (1854) & Lich. Fl. 401; ed. 3, 425; Mudd Man. 248; Cromb. Lich. Brit. 102. *A. ilicinella* Nyl. in Flora 1. 179 (1867); Carroll in Journ. Bot. v. 259 (1867); Cromb. l. c.; Leight. Lich. Fl. ll. c. *A. subexcedens* Nyl. in Flora lxii. 221 (1879); Cromb. in Grevillea viii. 29.

Exsicc. Cromb. n. 196; Larb. Lich. Hb. nos. 154, 277 (as *A. subexcedens*).

Hab. On holly.—*Distr.* Rare in S. England and in S. and W. Ireland.—*B. M.* Withiel, Cornwall; Ivybridge, Devon; New Forest, Hants; Eridge Park, Essex; St. Leonard's Forest, Sussex; Glenbower Wood, Cork; near Derrycurrihy, Cromaglow, Eagle's Nest, Cloghan and Torc Mt., Killarney, Kerry; Ballynahinch, Lough Inagh and Kylemore, Connemara, Galway.

Spores 3–5-septate, cells equal in size.

16. *A. cascarillæ* Leight. Lich. Fl. 394 (1871); ed. 3, 418.—Thallus pallid-glaucous, thin. Apothecia blackish, minute, simple, plane, oblong, or linear-oblong or irregularly difform by confluence; spores elongate, colourless, 4–5-septate, 18 μ long, 6 μ thick.—*Coniocarpon cascarillæ* Fée Ess. Crypt. 99, t. 15, f. 4 (1824) & Suppl. 94, t. 42, f. 3 (1837). Specimen not seen.

Hab. On bark.—*Distr.* Reported from Glencar, Kerry and Kylemore, Connemara, Galway, though Leighton (ll. c.) questions the identity of these plants. Those he examined had spores 3-septate, with a large upper cell. Fée's figure represents 4-septate spores, the cells equal in size. A specimen from Johnson marked *A. cascarillæ* does

not differ from *A. radiata*. The Irish specimens determined by Nylander (fide Leighton) had spores measuring $18 \mu \times 6 \mu$.

17. *A. pruinata* Steudel Nomencl. Bot. 267 (1824).—Thallus broadly effused, tartareous, thin whitish or pale-yellow, cracked and uneven, somewhat pulverulent (K + yellow, CaCl + rose-coloured). Apothecia brownish or lead-coloured, appressed, irregularly roundish or oblong, plane or slightly convex, rough, white-pruinose; spores linear-obovate, colourless, usually 4-, rarely 3- or 5-septate, the cells equal in size, $14\text{--}20 \mu$ long, $6\text{--}8 \mu$ thick; hymenial gelatine blue then wine-red with iodine. — *A. pruinosa* Ach. Lich. Univ. 147, t. 1, f. 3 (1810); S. F. Gray Nat. Arr. i. 480; Cromb. Lich. Brit. 103; Leight. Lich. Fl. 400; ed. 3, 424. *A. impolita* Borr. in Engl. Bot. Suppl. t. 2692, f. 1 (1831); Hook. in Sm. Engl. Fl. v. 143; Tayl. in Mackay Fl. Hib. ii. 104; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 440, t. 8, f. 35 (1854); Mudd Man. 248. *Patellaria pruinata* Pers. in Ust. Ann. Bot. vii. 28 (1794). *Verrucaria impolita* Hoffm. Deutschl. Fl. ii. 172 (1795). *Lichen impolitus* Ehrh. Crypt. n. 274 (1793) nomen. *Exsicc.* Leight. n. 131; Larb. Lich. Hb. n. 114.

Hab. On old oaks, ivy, elm, yew and old timber.—*Distr.* Frequent in England, recorded also from Wales and Ireland.—*E.* M. Castle Hornock, Penzance, Cornwall; Lustleigh, Devon; Stoke St. Mary, Somerset; Lyndhurst, New Forest, Hants; Shore, Surrey; Hurstpierpoint, Sussex; Ulting and Epping Forest, Essex; near Oaksey, Wilts; Twycross, Leicestershire; Hay Wood, Herefordshire; Battenhall, Worcestershire; Bettws-y-Coed, Carnarvonshire; Llanrwst, Denbighshire; Oswestry, Shropshire; Ickworth Park, Suffolk; Kildale, Cleveland, Yorkshire; Bishop Auckland, Durham; Tralee, Kerry; Adare, Limerick.

18. *A. radiata* Ach. Lich. Univ. 144 (1810) (incl. vars.).—Thallus developed under the bark, forming whitish or greyish determinate patches, sometimes with a dark outline. Apothecia small, dark-brown, rough, innate, clustered in substellate or radiate groups, pale within, the epithecium dark-brown; spores linear-clavate, 3-septate, rounded at the ends, the cells equal in size, colourless, sometimes with a clear epispore, $12\text{--}20 \mu$ long, $4\text{--}6 \mu$ thick; hymenial gelatine blue then violet, the asci and spores wine-red, with iodine. — *A. astroidea* Ach. in Schrad. Neu. Journ. Bot. i. 3, 17, t. 4, f. 4 (1806) & Syn. 6 (1814) (excl. var. *anastomosans*); Hook. Fl. Scot. ii. 36; S. F. Gray Nat. Arr. i. 479; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 438, t. 8, f. 32 (1854) & Lich. Fl. 396; ed. 3, 419; Mudd Man. 246 (incl. var. *anastomosans* (non Ach.)); Cromb. Lich. Brit. 103 pro parte. *Opegrapha radiata* Pers. in Ust. Ann. Bot. vii. 29 (1794). *O. astroidea* Ach. Meth. 25 (1803); Engl. Bot. t. 1847. *Lichen astroites* Ach. Lich. Suec. Prodr. 24 (1798).

Exsicc. Baxt. Stirp. Crypt. Oxon. n. 22; Bohl. n. 51 (as

Opegrapha epipasta); Mudd nos. 227, 229 (as var. *anastomosans*); Leight. n. 289; Larb. Lich. Hb. n. 112.

Hab. On smooth bark of trees in wooded regions.—*Distr.* General and common throughout the British Isles.—*B. M.* Sark; St. Breock, Cornwall; Ilsham, Torquay, Lydford, near Lustleigh and Ullacombe, Devon; Lyndhurst, New Forest, Hants; St. Leonard's, Hurstpierpoint and Glynde, Sussex; Ightham, Kent; Shere, Surrey; Epping Forest, Hockley Woods, Quendon and Ulting, Essex; Windsor Forest, Berks; Gosport Park, Leicestershire; Alfrick and Malvern, Worcestershire; Edderton Wood, Montgomeryshire; Builth, Breconshire; Barmouth, Merioneth; Bettws-y-Coed, Carnarvonshire; Gogmagog Hills, Cambridgeshire; near Buxton, Derbyshire; Cottishall, Norfolk; Easby Wood, Cleveland, Yorkshire; Hexham, Northumberland; near Edinburgh; Balmerino, Fife; Pearsie, Forfarshire; Glen Falloch, Glen Lochay, Finlarig, Killin and Aberfeldy, Perthshire; Appin and Barchaldine, Argyll; Hill of Ardo and Morrone, Braemar, Aberdeenshire; Fort William, Inverness-shire; Applecross, Ross-shire; Rostellan, Cork; Killarney, Kerry; Killaloe, Clare; Castlebar and Clare Island, Mayo.

Var. *Swartziana* Sydow Flecht. Deutschl. 243 (1887).—Thallus whitish or olivaceous, subdeterminate. Apothecia black, plane, clustered into irregular angular sometimes elongate shapes.—*Arthonia Swartziana* Ach. in Schrad. Neu. Journ. Bot. i. 3, 13, t. 4, f. 1 (1806); Engl. Bot. t. 2079; S. F. Gray Nat. Arr. i. 479; Hook. in Sm. Engl. Fl. v. 143; Tayl. in Mackay Fl. Hib. ii. 104; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 439 (1854) & Lich. Fl. 397; ed. 3, 420 (incl. *A. astroidea* var. *simulans* Leight.). *A. astroidea* var. *Swartziana* Hepp Flecht. Eur. n. 352 (1857); Mudd Man. 246; Cromb. Lich. Brit. 103.

Exsicc. Mudd n. 228; Leight. n. 70; Johns. n. 512.

Differs from the species in the more compact *ardellæ*, which are irregular in outline rather than distinctly stellate or radiate. When the *ardellæ* are somewhat innate, as it were rubbed down, it is *A. astroidea* var. *simulans* Leight. (Lich. Fl. ed. 3, 420).

Hab. On smooth bark of trees.—*Distr.* General and common throughout the British Isles.—*B. M.* Shanklin, I. of Wight; near Lyndhurst, New Forest, Hants; Ullacombe, near Bovey Tracey, Devon; St. Leonard's Forest, Sussex; Braydon Forest, Wilts; Hoe Street, Walthamstow, Hockley Woods and Ulting, Essex; near Worcester and Malvern, Worcestershire; Harboro' Magna, Warwickshire; near Barmouth, Merioneth; near Shrewsbury, near Wellington and near Acton Scott, Shropshire; Trefriw, Carnarvonshire; Brantsdale, Ayton and Airyholme Wood, Cleveland, Yorkshire; Teesdale, Durham; Alston, Cumberland; by the Falls of the Clyde, Lanarkshire; near Stirling, Ben Lawers and Finlarig, Killin, Perthshire; Appin, Argyll; Morrone, Braemar, Aberdeenshire; Askew Wood and Cromaglow, Killarney, Kerry; between Bandon and Innishannon, Cork; near Dublin; Mamturk Mts. and Delphi, Connemara, Galway; Glandarry Wood, Achill Isl., Mayo.

Var. *epipastoides* A. L. Sm.—Thallus whitish. Apothecia small, very slender, elongate, sparingly irregular; spores rather

smaller than in the species. — *A. astroidea* var. *epipastoides* Nyl. Lich. Scand. 259 (1861); Cromb. Lich. Brit. 103.

The apothecia are usually minutely lirellaform, though sometimes somewhat punctiform and similar to the following species.

Hab. On smooth bark of trees.—*Distr.* Rare in the Channel Islands, S. England and S. Ireland.—*B. M.* Noirmont, Jersey; Ilsham Walk, Torquay, Devon; Eagle's Nest and Killarney, Kerry.

19. *A. punctiformis* Ach. Lich. Univ. 141 (1810) pro parte & Syn. 4 (1814).—Thallus thin, indeterminate, whitish or copper-coloured. Apothecia dark-brown, plane or slightly convex, scattered, subinnate, roundish or oblong, internally pale; spores colourless, linear-clavate, or obovate, obtuse, 3–4-septate, the cells equal in size, 16–24 μ long, 5–8 μ thick; hymenial gelatine blue then dark, the asci wine-red, with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 438, t. 7, f. 31 (1854) (incl. f. *galactina* Leight. l. c.) (non Ach.) & Lich. Fl. 395; ed. 3, 419; Mudd Man. 247 pro parte; Cromb. Lich. Brit. 104. *A. epipasta* var. *microscopica* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 436, t. 7, f. 30 (1854) pro parte. *Opegrapha epipasta* Hook. in Sm. Engl. Fl. v. 144 pro parte (non Ach.); Engl. Bot. t. 1828?; Tayl. in Mackay Fl. Hib. ii. 105. *Hysterina epipasta* S. F. Gray Nat. Arr. i. 506 (1821)?

Closely allied to *A. radiata*, differing chiefly in the less determinate thallus and the smaller usually punctiform apothecia.

Hab. On smooth bark of trees.—*Distr.* Somewhat rare in S. England and W. Ireland.—*B. M.* New Forest, Hants; near Kylemore and Doughrugh Mt., Connemara, Galway.

Var. *melantera* Leight. Lich. Fl. 396 (1871).—Thallus somewhat darker-coloured than in the species. Apothecia rather elongate, slender; spores as in the species.—Leight. Lich. Fl. ed. 3, 419. *A. obscura* var. *melantera* Ach. Syn. 7 (1814). *A. epipasta* Mudd Man. 247 (1861) (non Koerb.) (spore measurements incorrect); Leight. Lich. Fl. 397; ed. 3, 420 (spore measurements too large). *A. astroidea* var. *epipasta* Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. 96 (1856); Cromb. Lich. Brit. 103. *Opegrapha microscopica* Sm. Engl. Bot. t. 1911 (1808). *Hysterina microscopica* S. F. Gray Nat. Arr. i. 506 (1821)?

Exsicc. Mudd n. 230 (as *A. epipasta*).

Distinguished from the species by the darker, shining thallus.

Hab. On branches and trunks of trees.—*Distr.* Rare throughout the British Isles. *B. M.* Noirmont Manor, Jersey; Newton Bushell, Devon; Huish Champflower, Somerset; Lewes, Sussex; Hockley Woods and Hatfield Peverel, Essex; Dolgelly, Merioneth; near Welshpool, Montgomeryshire; Stableford, Shropshire; Cliffrigg and Ayton, Cleveland, Yorkshire; Banks of Garry, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire; near Crosshaven, Cork.

20. *A. insinuata* Stirton in Trans. Glasgow Soc. Nat. 1875, 90.—Thallus whitish or pale, filmy, very thin. Apothecia brown or

brownish-black, adnate, rather prominent, round or oblong or somewhat irregular, at first veiled, sometimes with a somewhat squamulose thalline margin; asci almost globose; spores 4 to 8 in the ascus, colourless, sometimes slightly brownish, oblong, slightly tapering downwards, almost equally 4-septate, 14–21 μ long, 6–8 μ thick; hymenial gelatine bright-blue, the asci wine-red, with iodine.—Leight. Lich. Fl. ed. 3, 423.

The species is not unlike *A. punctiformis*. In the Stirton specimen from Blair Athole the spores are very distinctly septate, the upper cell sometimes slightly larger, a character evidently depending on the stage of maturity.

Hab. On trees.—*B. M.* Blair Athole, Perthshire. Originally recorded from near Killiecrankie.

§ iii. LECIDEOPSIS Almquist in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, 46 (1880). *Arthonia* subg. *Allarthonia* Nyl. in Flora lxi. 246 (1878) pro parte.

Algal cells Palmellaceæ or thallus wanting. Apothecia blackish; spores usually 1-, rarely pluri-septate.

Spores 1-septate.

21. *A. patellulata* Nyl. in Bot. Not. 1853, 95.—Thallus whitish, thin, effuse. Apothecia black, small, roundish or angular, appressed, plane, blackish within; spores obovate, colourless, 1-septate, small, 9–15 μ long, 3–5 μ thick, the upper cell somewhat thicker, the lower longer and oblong; hymenial gelatine wine-red with iodine.—Carroll in Journ. Bot. iii. 291 (1865); Croub. Lich. Brit. 105; Leight. Lich. Fl. 392; ed. 3, 416.

Hab. On smooth bark in wooded regions.—*Distr.* Rare in Ireland.—*B. M.* Carigunnel, near Limerick.

22. *A. lapidicola* Branth & Rostr. in Bot. Tidssk. iii. 245 (1869).—Thallus dark-olive-brown, thin, furfuraceous. Apothecia small, black, roundish, plane, blackish within; spores obovate, colourless, 1-septate, 11–16 μ long, 5–6 μ thick; hymenial gelatine wine-red with iodine.—Croub. Lich. Brit. 105; Leight. Lich. Fl. 393; ed. 3, 416. *A. ruderalis* Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. 100 (1856); Carroll in Journ. Bot. iv. 24 (1866). *A. fusca* Hepp Flecht. Eur. n. 534 (1860). *Lecidea lapidicola* Tayl. in Mackay Fl. Hib. ii. 124 (1836).

Exsicc. Leight. n. 398 (as *A. fusca*).

Sandstede in Abh. Nat. Ver. Bremen xxi. 45 (1912), places *A. fusca* as a separate species under *Allarthonia* with smaller spores.

Hab. On calcareous rocks.—*Distr.* Somewhat rare in various districts of the British Isles.—*B. M.* Fairlight, Hastings, Sussex; Mickleham, Kent; Cirencester, Gloucestershire; near Abergavenny, Monmouthshire; Dolgelly, Merioneth; Malvern, Worcestershire; Ben Lawers, Perthshire; Dunkerron and Cappaghmore Bridge, Kerry; Antrim.

23. **A. Lilliei** B. de Lesd. in Bull. Soc. Bot. Fr. lvii. 34 (1910).—Thallus blackish, leprose, very slight. Apothecia black, minute, about 1–2 mm. in diam., round, persistently plane; hypothecium colourless; hymenium colourless or pale-brown; paraphyses closely coherent, the apices free and capitate, the epithecium olivaceous; asci ventricose; spores 8 in the ascus, colourless, oblong or ellipsoid, 1-septate, scarcely constricted, the cells equal, 10–12 μ long, 4–5 μ thick; hymenial gelatine wine-red with iodine.—Lillie in Scott. Bot. Rev. i. 153 (1912); A. L. Sm. Monogr. i. 481 (1918). Specimen not seen.

Somewhat difficult to place in the lack of information as to the gonidia; it seems to agree with § *Lecideopsis* rather than with § *Euarthonia*.

Hab. On siliceous rocks. Collected by D. Lillie at Achastle, Caithness.

Spores 3–4-septate.

24. **A. paralia** Nyl. in Flora lx. 565 (1877).—Thallus dark-greyish or reddish-brown, thin, rather smooth. Apothecia dark-brown, roundish, nearly plane; colourless within; spores elongate-ovate, subconstricted in the middle, 3–4-septate, 18–22 μ long, 7 μ thick; hymenial gelatine wine-red with iodine.—Cromb. in Grevillea vi. 114; Leight. Lich. Fl. ed. 3, 421.

Exsicc. Larb. Lich. Hb. n. 113.

Hab. On maritime rocks.—B. M. Cleghan, Connemara, Galway (the only locality).

25. **A. myriocarpella** Nyl. in Ann. Sci. Nat. sér. 4, xx. 238 (1863).—Thallus pale-ashy-grey, effuse, thin, subareolate or subpulverulent, sometimes evanescent. Apothecia minute, brownish-black, roundish, plane or convex, blackish within; spores oblong-ovoid, colourless, 3-septate, 10–12 μ long, 3–4 μ thick.—Carroll in Journ. Bot. iii. 292 (1865); Cromb. Lich. Brit. 104; Leight. Lich. Fl. 394; ed. 3, 418. Specimen not seen.

Hab. On mica-schist rocks, collected at Aviemore, Inverness-shire.

Parasitic on other Lichens.

26. **A. varians** Nyl. Lich. Scand. 260 (1861).—Thallus none. Apothecia dull-black, rounded, scattered or confluent, plane or somewhat convex, roughish, internally pale-brown; spores oblong, usually 3-, sometimes 1- or 2-septate, colourless, 12–18 μ long, 6–8 μ thick; hymenial gelatine usually blue then wine-red with iodine.—Cromb. Lich. Brit. 104; Leight. Lich. Fl. 402; ed. 3, 426. *A. glaucomaria* Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. 98 (1856); Leight. in Ann. Mag. Nat. Hist. ser. 2, xviii. 330 (1856); Carroll in Nat. Hist. Rev. vi. 532 (1859). *A. parasemoides* Nyl. l. c. and in Mém. Soc. Sci. Nat. Cherb. ii. 330 (1854); Mudd Man. 251. *Lichen varians* Davies in Trans. Linn. Soc. (Bot.) ii. 284,

t. 28, f. 3 (1794). *Celidium varians* Arn. in Flora xlv. 312 (1862); Mass. Fungus Fl. iv. 110.

Exsicc. Baxt. Stirp. Crypt. n. 47; Mudd n. 238 (as *A. parasemoides*); Leight. n. 247 (as *A. glaucomaria*); Larb. Lich. Hb. n. 155; Cromb. n. 99.

The above species and the two following are frequently classified as discomycetous fungi. See Vouaux in Bull. Soc. Mycol. Fr. xxix. and xxx. 181 *et passim* (1913-14).

Hab. Parasitic on the apothecia of *Lecanora glaucoma*, destroying the hymenium. Also recorded by Carroll (*l. c.*) on the apothecia of *Diploschistes scruposus*.—*Distr.* Chiefly in mountainous and maritime regions.—*B. M.* Noirmont and La Moye, Jersey; Guernsey; Sark; Newlyn Cliff, Penzance, and St. Minver, Cornwall; Barmouth, Merioneth; Long Mynd, Shropshire; Pwllheli, Carnarvonshire; Ayton, Cleveland, Yorkshire; Milnthorpe, Westmorland; Portlethen, Kincardineshire; Appin, Argyll; Craig Guie, Braemar, Aberdeenshire; Lambay Island, Dublin.

27. *A. subvarians* Nyl. in Flora li. 345 (1868).—Thallus none. Apothecia minute, scattered or confluent, blackish-brown, more or less convex; spores oblong-ovoid, colourless, becoming brownish when old, 1-septate, 11-13 μ long, 4-5 μ thick; hymenial gelatine dark-dingy-brown with iodine.—*A. galactinaria* Leight. Lich. Fl. ed. 3, 426 (1879).

This species has been determined as *A. apotheciorum* by Almquist in K. Svensk. Vet.-Akad. Handl. 58 (1880) based on *Sphaeria apotheciorum* Massal. Ric. Lich. 26, fig. 41 (1852). The spores figured are too small for Nylander's species, but if Almquist is correct his name should be adopted.

Hab. Parasitic on the apothecia of *Lecanora galactina* subsp. *dispersa*.—*Distr.* Rare in S. England.—*B. M.* Glynde, Sussex; near Cirencester, Gloucestershire.

28. *A. punctella* Nyl. ex Carroll in Nat. Hist. Rev. vi. 532 (1859).—Thallus none. Apothecia minute, black, innate scattered; spores oblong-clavate, colourless, brownish, 1-septate, the upper cell largest; 15 μ long, 6 μ thick.—Mudd Man. 252; Cromb. Lich. Brit. 105; Leight. Lich. Fl. 403; ed. 3, 426.

Easily distinguished from the host by the minute size of the apothecia.

Hab.—Parasitic on the thallus of *Rhizocarpon alboatrum*.—*B. M.* Queenstown, near Cork (the only locality).

29. *A. peltigerea* Th. Fr. in Bot. Not. 1866, 15.—Thallus none. Apothecia rather large, orbicular, somewhat convex, appressed, black; hypothecium thick, dark-brown; paraphyses distinct, stout; spores oblong or ovoid-oblong, 1-septate, 15-22 μ long, 6-8 μ thick; hymenial gelatine deep-wine-red with iodine.

Hab. Parasitic on the thallus of *Peltigera* and *Solorina saccata*.—*B. M.* On the thallus of *Peltigera spuria* on wall-tops, Corriemulzie, Braemar, Aberdeenshire.

88. **ARTHOTHELIUM** Massal. Ric. Lich. 54 (1852) emend.; Mudd Man. 252 (1861). (Pl. 22.)

Thallus crustaceous, uniform. Algal cells *Trentepohlia*. Apothecia innate, immarginate, roundish or somewhat elongate and irregular; asci ovoid-pyriform, thickened at the apices; spores ovoid-ellipsoid, septate then muriform, colourless or brownish; paraphyses indistinct, branched, coherent.

With the general characters of *Arthonia*, but differing in the muriform spores.

1. **A. dispersum** Mudd Man. 252, t. 4, f. 99 (1861).—Thallus greyish-white or cream-coloured, thin, membranaceous, smooth. Apothecia small, innate, plane, simple or minutely radiate, congregate in small groups, brownish-black; spores oblong, muriform, colourless, 21–27 μ long, 10–15 μ thick; hymenial gelatine blue, the asci wine-red, with iodine.—*Opegrapha dispersa* DC. Fl. Franc. 308 (1805) pro parte (fide Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. 93 (1856)). *Arthonia dispersa* Duf. in Journ. Phys. lxxxvii. 203 (1818); Carroll in Nat. Hist. Rev. vi. 532 (1859). *A. anastomosans* Cromb. Lich. Brit. 103 (1870); Leight. Lich. Fl. 402; ed. 3, 425. *A. radiata* var. *anastomosans* Ach. Lich. Univ. 146 (1810).

Hab. On the smooth bark of trees, chiefly young oaks and hazel.—*Distr.* Rare in S. England and S. Ireland.—*B. M.* Near Ullacombe, Bovey Tracey, Devon; near Bantry Bay, Cork; Turk Mt., Croghan, Old Dromore and Eagle's Nest, Killarney, Kerry.

2. **A. spectabile** Massal. Ric. Lich. 54 (1852).—Thallus whitish, effuse, thin, unequal, subfarinaceous. Apothecia brownish-black, rather large, angularly roundish, often surrounded by a spurious thalline margin, scattered or crowded and subconfluent, internally dark-coloured; spores oblong, septate, muriform, colourless, becoming brown, 30–40 μ long, 9–15 μ thick; hymenial gelatine usually blue then wine-red with iodine.—*Arthonia spectabilis* Flot. ex Massal. l. c.; Carroll in Journ. Bot. vi. 100 (1868); Cromb. Lich. Brit. 103; Leight. Lich. Fl. 402; ed. 3, 425.

Hab. On trees. *Distr.* Rare in S. England, Wales and S. Ireland.—*B. M.* Dartmoor, Devon; Dolgelly, Merioneth; Cloghane, Killarney, Kerry.

Family XXVI. GRAPHIDACEÆ.

Thallus crustaceous. Algal cells *Trentepohlia*, or rarely *Palmella*. Apothecia usually linear (*lirella*), rarely oblong or oval, simple or branched, sessile or erumpent, marginate; paraphyses simple or branched and entangled; asci elongate-clavate, spores simple or variously septate or muriform, colourless or coloured.

The more distinctly elongate apothecia, which have a well-developed proper margin, distinguish Graphidaceæ from the two preceding families. It is represented in Britain by the following genera :—

Thallus with *Palmella* gonidia; apothecia oblong or ovoid.

Spores simple, colourless.

Hymenium simple.

Apothecia carbonaceous..... 89. **Lithographa.**

„ not carbonaceous ... 90. **Xylographa.**

Hymenium compound 91. **Ptychographa.**

Spores 1-septate, brown..... 92. **Encephalographa.**

Thallus with *Trentepohlia* gonidia; apothecia elongate or roundish.

Spores 1-septate, colourless or brown..... 93. **Melaspilea.**

Spores 3-pluri-septate.

Apothecia superficial.

Spores colourless..... 94. **Opegrapha.**

Apothecia immersed.

Spores colourless..... 95. **Graphis.**

Spores brown..... 96. **Phæographis.**

Spores muriform..... 97. **Graphina.**

89. **LITHOGRAPHA** Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 393 (1856). (Pl. 23.)

Thallus crustaceous, sometimes evanescent. Algal cells *Palmella*. Apothecia shortly elongate, lirelliform, carbonaceous, the disc usually narrow, the margins prominent, inflexed; hypothecium usually dark-coloured; paraphyses very rarely discrete; asci clavate, 8- or many-spored; spores simple, colourless.

1. **L. tesserata** Nyl. *tom. cit.* 441 & Lich. Scand. 290.—Thallus thickish, verrucose-areolate or areolate-rimose, greyish, pale-greyish-brown or whitish (K + yellow then reddish, CaCl —). Apothecia moderate in size, rather prominent, shortly lirelliform, obtuse, simple or at times divided, black, the margin somewhat shining; disc narrow; paraphyses irregular or indistinct; hypothecium thick, blackish-brown; spores 8 in the ascus, oblong or ellipsoid, 8–15 μ long, 5–8 μ thick; hymenial gelatine pale-bluish then tawny-wine-red with iodine.—Mudd Man. 225, t. 4, fig. 87; Cromb. Lich. Brit. 95; Leight. Lich. Fl. 360; ed. 3, 393. *Opegrapha tesserata* DC. Fl. Franc. ii. 313 (1805); Borr. Engl. Bot. Suppl. t. 2632, f. 2; Hook. in Sm. Engl. Fl. v. 146; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 88, t. 5, f. 1 (1854).

Essicc. Leight. n. 396.

The thalline areolæ are either contiguous or somewhat scattered, the black hypothallus being more or less visible. The apothecia, variable in form, are either solitary or crowded and congested.

Hab. On rocks from upland to alpine situations in mountainous regions. *Distr.* With certainty only in N. Wales, N. England, on the Grampians, and in the N.W. Highlands of Scotland.—*B. M.* Near Llyn Aran and Cader Idris, Merioneth; Ystrad-ffin, Carmarthenshire;

Capel Curig, Cwm Clyd, Nant Frangeon, Snowdon, Carnarvonshire; near Staveley, Kendal, Westmorland; Holwick Scar, Teesdale, Durham; Ben Lawers, Perthshire; summit of Morrone, Braemar, Aberdeenshire; Hills of Applecross, Ross-shire.

2. *L. flexella* A. Zahlbr. in Engler & Prantl. Nat. Pflanzenf. i. 1*, 93 (1903).—Thallus effuse, thin, whitish, or nearly obsolete (K —, CaCl —). Apothecia superficial, minute, black, oblong or angular, the disc narrow and slit-like or irregularly dilated; hypothecium brown or blackish-brown; paraphyses not well discrete, dark at the apices; spores 8 in the ascus, ovoid or ellipsoid, minute, 4–6 μ long, 2–3 μ thick; hymenial gelatine bluish then sordid-wine-red with iodine.—*Limböria flexella* Ach. in Vet. Acad. Handl. 1815, 258. *Xylographa flexella* Fr. Summa Veg. Scand. 372 (1849); Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 128 (1857); Cromb. in Journ. Bot. xiv. 362 (1876); Leight. Lich. Fl. ed. 3, 392.

An aberrant species, allied to *Xylographa*, but with a dark carbonaceous hypothecium.

Hab. On stumps of felled trees.—*B. M.* Oakley Park, near Cirencester, Gloucestershire.

3. *L. Andrewii* Stirton in Scott. Nat. 1878, 300.—Thallus indeterminate, thickish, subareolate, white or greyish-white (K —, CaCl —). Apothecia small, sessile or innate-sessile, roundish or oblong, simple or rarely divided, the margins prominent, black, the epithecium becoming applanate; hypothecium brownish; paraphyses slender, discrete; spores ellipsoid or subglobose 8–9 μ long, 5–6 μ thick, with a distinct epispore; hymenial gelatine not tinged, the asci tawny-yellow, with iodine.—Leight. Lich. Fl. ed. 3, 394.

The apothecia in the single specimen seen are crowded; Stirton states that they are albo-velate in a young state.

Hab. On a granitic rock in an upland hilly district.—*B. M.* Cairn Edward, New Galloway, Kireudbrightshire (the only locality).

4. *L. dendrographa* Nyl. in Flora xlvii. 488 (1864).—Thallus effuse, very thin, greyish (K —, CaCl —), subevanescent. Apothecia erumpent, linear, oblong or elliptical, simple or slightly divided-furcate, black, concolorous within; epithecium narrow, becoming applanate; paraphyses slender, irregular, not well discrete; hypothecium brownish-black; ascus many-spored; spores ellipsoid, 5–8 μ long, 3–4 μ thick; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. 95; Leight. Lich. Fl. 361; ed. 3, 393.

In the British specimens the thallus is usually but little visible, and becomes at length quite obsolete. The apothecia are numerous and crowded, though at times somewhat scattered. When these are

simple the plant has very much the external aspect of a *Hysterium*. Zahlbruckner *l. c.* considers that species with many-spored asci should be classified under *Biatorella*.

Hab. On the trunks of old trees in maritime and upland tracts.—*Distr.* Rather local and scarce in S. and S.W. England.—*B. M.* Colrinick Park, Cornwall; near Sidmouth. Cockington, near Torquay and the Dart, Devon; Swanage, Dorset; Whitefield, I. of Wight; New Forest, Hants.

5. *L. petræa* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 393 (1856).—Thallus obsolete. Apothecia linear, simple, black, slightly shining, gregarious, often somewhat flexuose; margins tumid; disc narrow; hypothecium thick, black; paraphyses very slender, somewhat branched; ascus many-spored; spores very minute, 3–4 μ long, 1 μ thick; hymenial gelatine pale-bluish, then wine-red with iodine.—Cromb. Lich. Brit. 95; Leight. Lich. Fl. 360; ed. 3, 393. *Opegrapha petræa* Dur. Expl. Sci. Algér. 278 (1846) (excl. syn.) (non Ach.).

Exsicc. Larb. Cæsar. n. 40.

Not to be confounded with *Biatorella simplex*, to states of which it bears considerable resemblance, but differs in the lirelliform, congregate apothecia and the black hypothecium. The thallus is indicated merely by a rudimentary dark hypothallus.

Hab. On rocks, in maritime districts.—*Distr.* Found only in the Channel Islands and W. Ireland; no doubt to be detected elsewhere.—*B. M.* Le Fret, Noirmont and La Moye, Jersey; near Kylemore and Lettermore, Galway.

90. **XYLOGRAPHA** Fr. Summa Veg. Scand. 372 (1849) pro parte; Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. 187 (1855); Massée Fungus-Flora iv. 64 (as fungus). (*Stictis* § *Xylographa* Fr. Syst. Myc. ii. 197 (1823) emend.) (Pl. 24.)

Thallus developed under the bark (hypophlœodal). Algal cells *Palmella*. Apothecia innate or erumpent, lirelliform, not carbonaceous, roundish-oblong or irregular; the disc plane or concave; hypothecium usually pale; paraphyses slender; spores 8 in the ascus, simple, colourless; spermatogones with simple sterigmata and acicular curved spermatia.

Differs from *Lithographa* in the plane or concave apothecia and in the colourless or pale hypothecium.

1. **X. parallela** Fr. Summa Veg. Scand. 372 (1849).—Thallus forming elongate whitish spots or little visible (K —, CaCl —). Apothecia innate, erumpent, black, narrowly linear, straight, developed in parallel rows, at first concave with slightly elevated margin, becoming plane and immarginate; hypothecium colourless; paraphyses discrete, brownish at the apices; spores ellipsoid, 11–16 μ long, 5–7 μ thick; hymenial gelatine bluish then violet-coloured with iodine.—Cromb. Lich. Brit. 95; Leight. Lich. Fl.

362; ed. 3, 391; Mass. Fungus-Flora iv. 64. *Lichen parallelus* Ach. Lich. Suec. Prodr. 23 (1798). *Stictis parallela* Fr. Syst. Myc. ii. 197 (1823); Hook. in Sm. Engl. Fl. v. 2, 213 (1836); Cooke Brit. Fung. 736 pro parte.

Ersicc. Cromb. n. 96.

Easily recognized by the regular arrangement of the fructification. In the British specimens the thallus is but seldom distinct, being indicated merely by scattered gonidia among the fibres of the substratum.

Hab. On old fir palings in upland tracts of mountainous districts. — *Distr.* Seen only from among the Grampians, Scotland, where it is not infrequent. — *B. M.* Glen Falloch, Glen Lochay, Ben Lawers, Pass of Killiecrankie, Glen Fender, and Killin, Perthshire; Crathie, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire.

Var. *pallens* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 128 (1857). — Thallus as in the species. Apothecia rather smaller, pale or pale-brown. — Cromb. in Grevillea i. 173; iii. 143; Leight. Lich. Fl. ed. 3, 391. *Xylographa scaphoidea* Stirton in Grevillea iii. 35 (1875); Leight. l. c.

Differs only in the paler colour of the apothecia, though at times they are here and there concolorous with those of the species.

Hab. On old fir palings in mountainous districts. — *Distr.* Found sparingly in a few localities among the S. Grampians, Scotland. — *B. M.* Ben Lawers, Glen Lochay, Killin and Pass of Killiecrankie, Blair Athole, Perthshire.

Form *elliptica* Nyl. ex Cromb. in Journ. Bot. xi. 135 (1873) nomen; Leight. Lich. Fl. ed. 3, 391 (1879). Apothecia shorter, oblong or difform, blackish or brown.

Differs in the form of the apothecia, which vary also in colour according to age and exposure.

Hab. On old palings and denudate trunks of trees in mountainous regions. — *Distr.* Here and there among the Grampians, Scotland. — *B. M.* Achmore, Killin, Ben Lawers and Pass of Killiecrankie, Perthshire; Crathie, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire.

2. *X. laricicola* Nyl. in Flora lviii. 13 (1875). — Thallus effuse, very thin, greyish-white (K —, CaCl —), often scarcely visible. Apothecia superficial, minute, oblong or slightly flexuose, at length somewhat appanate with evanescent margin, black, opaque, within whitish; epithecium brown; paraphyses absent or abnormal (membranaceous); hypothecium brown; spores ellipsoid, 12–15 μ long, 7–8 μ thick; hymenial gelatine tawny-wine-coloured with iodine. — Cromb. in Grevillea iii. 128; Leight. Lich. Fl. ed. 3, 391.

Ersicc. Cromb. n. 97.

Interesting as occurring on living trees. The apothecia are somewhat irregularly scattered.

Hab. On the bark of an old larch tree, near its base, in an upland mountainous region.—*B. M.* Ben Lawers, Perthshire (the only locality).

3. **X. spilomatica** Th. Fr. Lich. Scand. 639 (1874).—Thallus effuse, greyish-white, thinnish, with numerous yellowish-green soredia (K —, CaCl —). Apothecia erumpent, subminute, innate, sessile, roundish or difform, plane, reddish or sordid-yellowish-red, thinly margined; hypothecium colourless; paraphyses slender, subdiscrete, pale-brownish at the apices; spores ellipsoid, 8–12 μ long, 4–6 μ thick; hymenial gelatine bluish then violet with iodine.—*Agyrium spilomaticum* Anzi in Comm. Soc. Critt. Ital. ii. 20 (1864).

The sorediate thallus, which, as noticed by Th. Fries, is often sterile, apart from the other diagnostic characters, readily identifies the plant. The apothecia, sparingly visible in the British specimen, are either solitary or conglomerate, and in the latter case more or less corrugate.

Hab. On a decorticated fir tree in an upland mountainous district.—*B. M.* Mar Forest, Braemar, Aberdeenshire.

91. **PTYCHOGRAPHA** Nyl. in Flora lvi. 315 (1874). (Pl. 25.)

Thallus effuse. Algal cells *Palmella*. Apothecia elongate, compound, with 2 to 4 parallel hymenia; margins prominent, incurved; hypothecium black, carbonaceous; spores 8 in the ascus, simple, colourless.

Distinguished from all other genera of the family by the compound hymenia.

P. xylographoides Nyl. l. c.—Thallus effuse, in thin greyish-white spots or nearly obsolete (K —, CaCl —). Apothecia slightly prominent, plane above, margined, black, concolorous within; epithecium longitudinally 1- or 3-plicate, subincolorous; hypothecium and perithecium black; spores ellipsoid, 11–14 μ long, 6–7 μ thick; hymenial gelatine wine-red with iodine.—Cromb. in Journ. Bot. xii. 257, t. 150 (1874); Leight. Lich. Fl. ed. 3, 392.

Exsicc. Cromb. n. 192.

Might at first sight be taken for *Xylographa parallela*, which it closely resembles in the parallel grouping of the apothecia. It is, however, separated by the peculiar character of the hymenia.

Hab. On a decorticated trunk of *Pyrus Aucuparia* in a subalpine mountainous district.—*B. M.* Craig Calliach, Killin, Perthshire (the only locality).

92. **ENCEPHALOGRAPHA** Massal. Geneac. Lich. 13 (1854). *Melanospora* Mudd Man. 226 (1861). (Pl. 26.)

Thallus effuse, crustaceous. Algal cells *Palmella*. Apothecia sessile, usually in groups, elongate, roundish or angular, simple or branched; disc usually narrow; hypothecium carbonaceous,

black; spores 5 to 8 in the ascus; colourless to dark-brown, 1-septate.

E. cerebrina Massal. Misc. Lich. 49 (1856).—Thallus sub-determinate, thickish, tartareous, chalky-white. Apothecia black, scattered or congregate, sessile, oblong, roundish or angular, the margin inflexed; asci clavate, 8-spored; spores linear-oblong, often slightly constricted in the middle, dark-brown or nearly blackish, 15–23 μ long, 8–12 μ thick; hymenial gelatine bluish with iodine.—*Opegrapha cerebrina* DC. Fl. Fr. ii. 312 (1805); Borr. Engl. Bot. Suppl. t. 2632, f. 1: Hook. in Sm. Engl. Fl. v. 146; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 88, t. 5, f. 2 (1854); Cromb. Lich. Brit. 100. *Melanospora cerebrina* Mudd Man. 226, t. 4, f. 88 (1861). *Lithographa cerebrina* Leight. Lich. Fl. 361 (1871); ed. 3, 394.

Hab. On calcareous rocks in hilly districts.—*Distr.* With certainty only in N. England, Wales and S.W. Ireland.—*B. M.* Llangollen, Denbighshire; Penhill, Yorkshire; Teesdale, Durham; near Arnside, Westmorland; Whitbarrow, Cumberland; Dunkerron, Kerry.

93. **MELASPILEA** Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 416 (1856). *Stictographa* Mudd Man. 226 (1861), pro parte. (Pl. 27.)

Thallus thin, sometimes developed below the bark (hypophlœodal) or wanting. Algal cells *Trentepohlia*. Apothecia black and carbonaceous, superficial or immersed, roundish or elongate, simple or shortly branched, with a proper margin only; disc narrow or flattened; hypothecium colourless or dark-coloured; paraphyses slender, free; asci elongate or narrowly clavate, 8-spored; spores ellipsoid, fusiform, or ovoid, colourless, becoming brown, usually 1-septate. Spermatogones with simple sterigmata and straight spermatia. The species *Melaspilea Patersoni* Stirton (in Scott. Nat. iv. 29 (1877); A. L. Sm. Monogr. Part ii. 229) is a discomycetous fungus, *Schizorylon* sp. It was collected on dead bark at Ben Brecht, Argyll, by Dr. R. H. Paterson.

1. **M. lentiginosa** A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, 96 (1903).—Thallus thin, smooth, cream-coloured, limited by a brownish-black line. Apothecia very small, black, sessile, oblong or linear, slender, straight, simple; margins tumid, incurved; disc very narrow; asci clavate; spores irregularly obovate, unequally 2-celled, pale brown, 15–16 μ long, 6–7 μ thick.—*Opegrapha lentiginosa* Lyell ex Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 211, t. 6, f. 16 (1854). Carroll in Journ. Bot. iii. 291 (1865); Cromb. Lich. Brit. 100; Leight. Lich. Fl. 372; ed. 3, 395. *Stictographa lentiginosa* Mudd Man. 226, t. 4, f. 89 (1861).

Exsicc. Cromb. n. 98.

The thallus forms somewhat extended patches on the bark; the apothecia are usually numerous and crowded and grow in all directions. The asci in Crombie's specimen are thickened at the tips.

Hab. On trees.—*Distr.* Somewhat local, but plentiful where it occurs in S. England and S. Ireland.—*B. M.* Launceston and Penzance, Cornwall; Lustleigh, Devon; near Brockenhurst and Lyndhurst, New Forest, Hants; St. Leonard's Forest, Sussex; Curraghmore, Waterford; Glenbower Wood and Castle Martyr, near Cork.

2. *M. lentiginosula* A. L. Sm.—Thallus evanescent. Apothecia small, black, prominent, elliptical, straight, rarely forked, sparsely scattered; disc narrow, slit-like; margins tumid, incurved; spores obovoid, brown, 1-septate, constricted, 20–23 μ long, 10–11 μ thick; hymenial gelatine faintly blue with iodine.—*Opegrapha lentiginosula* Nyl. in *Flora* xlviii. 355 (1865); Carroll in *Journ. Bot.* iv. 24 (1866); *Cromb. Lich. Brit.* 100; *Leight. Lich. Fl.* 373; ed. 3, 395.

Hab. On pines in upland regions.—*B. M.* Ravenscar, Westmorland; Glen Falloch and Black Wood of Rannoch, Perthshire.

3. *M. diplasiospora* A. Zahlbr. *l. c.*—Thallus cream-coloured, thin, smooth, effuse. Apothecia small, black, oblong, somewhat immersed, disc rather expanded, the margins thin, elevated, inflexed; spores obovate, dark-brown, 1-septate, constricted, 27–32 μ long, 12–16 μ broad; hymenial gelatine pale blue with iodine.—*Opegrapha diplasiospora* Nyl. in *Act. Soc. Sci. Fenn.* vii. 476 (1863); Carroll in *Journ. Bot.* vi. 100 (1868); *Cromb. Lich. Brit.* 100; *Leight. Lich. Fl.* 373; ed. 3, 395.

Similar in appearance to *M. lentiginosa*, but the apothecia are rather larger and the spores larger and darker coloured.

Hab. On holly in upland districts.—*Distr.* Rare in S.W. Ireland.—*B. M.* Tore Mt. and Cromaglown, Killarney, Kerry.

4. *M. ochrothalamia* Nyl. in *Flora* xlviii. 355 (1865).—Thallus effuse thin, sordid-greenish. Apothecia black or brownish, minute, adnate, roundish, plane, obsoletely margined, ochraceous-yellow within; spores ovoid, 1-septate, brownish-black, 17–21 μ long, 7–10 μ thick; hymenial gelatine not tinged with iodine. Carroll in *Journ. Bot.* vi. 101 (1868); *Cromb. Lich. Brit.* 106; *Leight. Lich. Fl.* 405; ed. 3, 436.

Allied apparently to *M. arthonioides* Nyl. (in *Act. Soc. Linn. Bord. sér.* 3, i. 416 (1856)), a plant of France, Switzerland and Algiers, which may also occur in England, but differs in the colour of the apothecia internally, and of the larger spores. The specimens seen are well fertile.

Hab. On smooth bark of trees in upland wooded districts.—*Distr.* Rare in S. and W. Ireland.—*B. M.* Glenbower Wood and near Enniskean, Cork; Mangerton, Killarney, Kerry.

5. **M. amota** Nyl. in Flora l. 178 (1867).—Thallus effuse, whitish or scarcely visible. Apothecia black, innate, moderate in size, roundish or angular; margins thin, uneven; hypothecium thin, dark-brown; paraphyses slender, very few; epithecium brownish or yellowish-brown; spores 4 to 8 in the ascus, ellipsoid-ovoid, 1-septate, constricted in the middle, colourless or faintly brownish, $16-22\ \mu$ long, $7-10\ \mu$ thick; hymenial gelatine and asci slightly and evanescently blue with iodine.—Carroll in Journ. Bot. v. 259 (1867); Leight. in Ann. Mag. Nat. Hist. ser. 3, xx. 256 (1867) & Lich. Fl. 404; ed. 3, 436; Cromb. Lich. Brit. 105.

Distinguished by the rather large apothecia, the almost colourless spores and the almost entire absence of paraphyses. The apothecia are scattered or sometimes several congregate and are often circumscissed.

Hab. On the branches of old trees, chiefly oak.—*Distr.* Very local in S.W. Ireland.—*B. M.* Turk Mt., Dinish, Muckross, Cromaglow and near Derrycunihy, Killarney, Kerry.

6. **M. constrictella** A. L. Sm. Thallus whitish, thin. Apothecia black, simple, sometimes aggregate, internally pallid-brown; perithecium lateral; disc broad, concave or flattened; paraphyses crowded, irregular, not well distinct, brown at the apices; hypothecium colourless; spores obovoid, colourless, 1-septate, constricted, $12-17\ \mu$ long, $4.5-6.5\ \mu$ thick; hymenial gelatine untinged with iodine.—*Opegrapha constrictella* Stirton in Scott. Nat. iv. 29 (1877); Leight. Lich. Fl. ed. 3, 396.

The specimen from Ben Brecht in the Stirton herbarium bears the note "came (nearly certainly) from New Zealand or Australia." The published description agrees with the anatomical characters; the epithecium becomes blue with potash; the asci have thickened tips.

Hab. On old bark.—*B. M.* Ben Brecht, Argyll.

7. **M. proximella** Nyl. ex Norrl. in Not. Sällsk. Faun. & Fl. Fenn. förh. xiii. 342 (1873).—Thallus effuse, whitish, developed under the bark or evanescent. Apothecia small, black, roundish, obtusely margined; disc plane, somewhat wrinkled; hypothecium colourless or sordid; spores ovoid, becoming brown, 1-septate, $17-21\ \mu$ long, $7-10\ \mu$ thick; hymenial gelatine brownish and then wine-red with iodine. *Lecidea proximella* Nyl. in Herb. Mus. Fenn. 90 (1859) nomen. *Arthonia proximella* Nyl. Lich. Scand. 262 (1861); Leight. in Grevillea i. 60, t. 4, f. 3 & Lich. Fl. ed. 3, 417.

Somewhat resembling *Arthonia patellulata* but differing in the character of the spores.

Hab. On trunks of trees, chiefly oak and holly in wooded upland districts. —*Distr.* Only a few localities in S. and W. England, but

no doubt to be detected elsewhere.—*B. M.* Near Stoncy Cross, New Forest, Hants; Ardingly Woods, Sussex; near Canterbury, Kent; Braydon Forest, Wilts; Sapperton, Gloucestershire; Dolgelly, Merioneth; near Acton Scott, Shropshire; Gwydir Woods, Bettws-y-Coed and Moel-y-Gest, Carnarvonshire.

8. *M. interjecta* A. L. Sm.—Thallus whitish or faintly greenish, tartareous, thin, furfuraceous, almost evanescent. Apothecia black, elongate, somewhat shining, simple or sometimes branched, solitary or clustered; disc narrow, slit-like, the margins tumid, inflexed; hypothecium black; spores colourless, oblong, 1-septate, 21–23 μ long, 9 μ thick.—*Lithographa interjecta* Leight. Lich. Fl. 361 (1871); ed. 3, 394.

Found originally at Barmouth, Merioneth, it is separated from *Lithographa* by the septate spores. This specimen from Llanwrtyd collected by H. H. Knight and determined by W. Watson has rather smaller spores than the size given by Leighton.

Hab. On slaty rocks.—*Dist.* Very rare.—*B. M.* Llanwrtyd, Breconshire.

9. *M. vermifera* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 146, t. 22, figs. 21–24 (1876).—Thallus obsolete. Apothecia black, minute, irregularly angular, oblong, imbedded in the cortical layer, when dry plane and surrounded by a minute upraised jagged margin of the cortical layer, when wet somewhat convex and immarginate; hymenium pale; paraphyses slender, pale at the apices; asci linear-obovate; spores innumerable, arranged spirally in the ascus, colourless, cylindrical-fusiform, pointed, vermiform, 1-septate, 22 μ long, 2 μ thick—Leight. Lich. Fl. ed. 3, 437. Specimen not seen.

Hab. Parasitic on thallus and apothecia of *Pertusaria globulifera*; Trefriw, Carnarvonshire. The species requires further investigation.

94. **OPEGRAPHA** Humb. Fl. Friberg. 57 (1793) pro parte. *Alyxoria* S. F. Gray Nat. Arr. I. 504 (1821). (Pl. 28.)

Thallus crustaceous, superficial or developed under the bark (hypophlœodal), thin or sometimes almost wanting. Algal cells *Trentepohlia*. Apothecia (*lirellæ*) black and carbonaceous, superficial, elongate or roundish, simple or branched, with a proper margin only; disc narrow and slit-like or somewhat flattened and plane; paraphyses vertical, branched; asci clavate or elongate, usually 8-spored; spores colourless, sometimes becoming brownish, linear-oblong, fusiform or acicular, pluriseptate.

Spores 3-septate.

1. *O. herpetica* Ach. Meth. 23 (1803).—Thallus thin, more or less cracked or rugged, grey or usually olivaceous, effuse or limited by a brown line. Apothecia small, innate, oval, oblong or linear, obtuse, simple or forked, straight or curved; margins

thick, rounded and inflexed, the disc slit-like, dilated in age; spores fusiform, 3-septate, colourless or pale-yellow, 17–27 μ long, 4–5 μ (or 30 $\mu \times 7 \mu$) thick; spermogones with arcuate spermatia 6–8 μ long, 2 μ thick (fide Nyl. Lich. Par. 107 (1896)).—Engl. Bot. t. 1789?; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 205, t. 5, f. 12a (1854) & Lich. Fl. 373; ed. 3, 396 (incl. ff. *vera* and *rubella*); Mudd Man. 234 (incl. vars. *vera* and *rufescens* with var. *rubida* pro parte); Carroll in Journ. Bot. iii. 291 (1865); Cromb. Lich. Brit. 99 (incl. var. *disparata* Ach. Syn. 73 (1814)). *O. rufescens* Pers. in Ust. Ann. Bot. vii. 29, t. 2, f. 3a (1794)?; Hook. in Sm. Engl. Fl. v. 144?; Tayl. in Mackay Fl. Hib. ii. 105? *O. rubida* Chev. Hist. Graph. 80, t. 18, ff. 1 & 2 (1824). *Lichen herpeticus* Ach. Lich. Succ. Prodr. 20 (1798). *Hysterina herpetica* S. F. Gray Nat. Arr. i. 506 (1821). *H. disparata* S. F. Gray l. c.

Exsicc. Leight. n. 221; Mudd n. 214.

The different varieties and forms mentioned emphasize particular states of thallus or fructification: in var. *vera* the apothecia are small and simple, they are more prominent in var. *rubella*, while in var. *disparata* the disc is slightly more open. The forms and varieties recorded below merge into each other. There is a suspicion of reddish colour on the application of potash.

Hab. On trees.—*Distr.* Rather frequent throughout the British Islands.—*B. M.* Near Ilsham, Torquay, and near Exeter, Devon; near Lyndhurst, Hants; Hoekley Woods, Essex; (Charlton Forest, Berks; Oxford; Derbyshire; Airyholme Wood, Easby Wood, Ayton and Ingleby, Cleveland, Yorkshire; near Cartland Crags, Lanarkshire; Dunkeld, Perthshire.

Var. *elegans* Borr. ex Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 207 (1854).—Thallus slightly pulverulent or scurfy. Apothecia small, curved and wavy, often stellate.—Mudd Man. 235; f. *elegans* Leight. Lich. Fl. 374; ed. 3, 397. Var. *rubida* Mudd l. c. pro parte.

Exsicc. Leight. n. 286.

Hab. On trees. *Distr.* Somewhat rare in England and Ireland. *B. M.* Ivybridge and Ilsham, Torquay, Devon; near Minstead, New Forest, Hants; St. Leonard's Forest, Sussex; near Bath, Somerset; Hollybush Hill, Malvern, Worcestershire; Easby Wood, Airyholme Wood and Ingleby, Cleveland, Yorkshire; Ballyedmond Glen, Cork.

Var. *fuscata* Schær. Enum. 156 (1850).—Thallus dark, dingy-olive, otherwise as in the species. *O. herpetica* var. *rufescens* Mudd Man. 235 (1861) (excl. syn.), (& var. *rubida* Mudd l. c. pro parte); Cromb. Lich. Brit. 99; form *rufescens* Leight. Lich. Fl. 375; ed. 3, 397 pro parte. *O. rubella* Pers. tom. cit. 31?; Sm. Engl. Fl. t. 2347 (1811); Hook. in Sm. Engl. Fl. v. 144. *Lichen rubellus* Ach. Lich. Succ. Prodr. 22 (1798).

Distinguished by the darker thallus. The species *O. rufescens* has been restricted by Nylander (Lich. Par. 107 (1896)) to forms similar

to *O. herpetica*, but with straight spermatia, 4-5 μ long, 1 μ thick, a character I have been unable to verify in any of our British specimens.

Hab. On trees.—*Distr.* Not uncommon in England and Wales.—*B. M.* Whitestaunton, Somerset; Cirencester, Gloucestershire; Chalkney Woods, White Colne, Hadleigh Woods, Ulting, Hatfield Peverel and Epping Forest, Essex; Patcham, near Worcester; Gopsall Wood, Leicestershire; Suffolk; Ingleby, Yorkshire.

Form **arthonoidea** Leight. Lich. Fl. ed. 3, 397 (1879).—Thallus as in the preceding variety. Apothecia suborbicular, innate, immarginate, plane.—*Opegrapha rufescens* var. *arthonoidea* Schaer. Spicil. 328 (1836).

Hab. On ash trees.—*Distr.* Rare in England.—*B. M.* Chalford, Gloucestershire.

Var. **subocellata** Ach. Syn. 73 (1814).—Thallus somewhat pulverulent. Apothecia small, oblong, simple or substellate, embedded in the thallus and surrounded by a white margin.—Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 206, t. 5, fig. 12 (1854) & Lich. Fl. 374; ed. 3, 396; Mudd Man. 234; Cromb. Lich. Brit. 99.

Exsicc. Leight. n. 222.

Regarded by Nylander as a variety of *O. rufescens*. It is easily recognized by the spurious white margin of the apothecia. The spermatia in our British specimens so far as observed are minute and somewhat ovoid, 3 μ long and 1-2 μ thick.

Hab. On trees.—*Distr.* Frequent in N. and S. England, rare in Wales, the Channel Islands, and Ireland.—*B. M.* Near Exeter and near Becky Falls, Devon; New Forest, Hants; near Bath, Somerset; Tilgate, near Clayton, near Glynde and Balcombe, Sussex; Epping Forest, Essex; Airyholme Wood, Easby Wood, and Cliffrigg, Cleveland, Yorkshire; Killarney, Kerry.

2. **O. contexta** Stirton in Grevillea iii. 35 (1874).—Thallus reddish-buff-coloured, thin, limited by the brown hypothallus. Apothecia small, black, flattened, roundish, usually aggregate, the disc gyrose-plicate; hypothecium blackish-brown; paraphyses indistinct; spores fusiform, blunt at the apices, 3-septate, colourless, 17-25 μ long, 4.5 μ thick.—Leight. Lich. Fl. ed. 3, 403. Specimen not seen.

Perhaps only a form of the preceding.

Hab. On elm, near Grantown, Inverness-shire.

3. **O. atra** Pers. in Ust. Ann. Bot. vii. 30 (1794).—Thallus thin, forming white or yellowish patches, sometimes limited. Apothecia black, numerous, lying in all directions or subparallel, linear, usually simple, flexuose; disc slit-like, narrow, uniform, the margins thick, elevated, wavy; hypothecium dark, reddish upward; spores obovate-fusiform, 3- or rarely 4-septate, colour-

less, rather small, 14–20 μ long, 4 μ thick; hymenium yellow then wine-red, the upper part blue, with iodine; spermatogones with straight spermatia, 4–5 μ long, 1 μ thick.—Hook. in Sm. Engl. Fl. v. 145 pro parte; Tayl. in Mackay Fl. Hib. ii. 105; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 203, t. 5, f. 11 (1854) & Lich. Fl. 375; ed. 3, 398 (incl. f. *tenuior* Nyl. ex Leight. l. c. ed. 3, 400 (1879)); Mudd Man. 232; Cromb. Lich. Brit. 98 pro parte; f. *ochrocheila* Leight. Lich. Fl. 377 (1871); ed. 3, 400. *O. denigrata* Sm. Engl. Bot. t. 1753 (1807) (non Ach.). *O. ochrocheila* Nyl. in Flora xlviii. 212 (1865).

Essicc. Mudd nos. 206, 208; Leight. n. 220 (the two latter as *O. varia* var. *diaphora*); Larb. Lich. Hb. n. 190 (as *O. atra* var. *tenuior*); Johns. n. 514.

The ochraceous margins of *O. ochrocheila* are due to the presence of the yellow granules of a crustaceous *Placodium* (K + crimson).

Distinguished from *O. herpetica* by the longer, distinctly marginate apothecia and the usually reddish-brown colour internally.

Hub. On trees.—*Distr.* Common throughout the British Isles.—*B. M.* St. Peter's Valley, Jersey; Luxulion, Cornwall; I. of Wight; Beeding Windmill, Three Bridges, Crawley, Mendon, and Saddlecomb, Sussex; Romsey, Hants; Epping Forest, Hatfield Peverel, and Ulting, Essex; Worcester; Bath, Somerset; Bala, Merioneth; Trefriw, Carnarvonshire; I. of Man; Airyholme Wood and near Ayton, Cleveland, Yorkshire; Ettersgill, Teesdale, Durham; near Glasgow, Lanarkshire; Blair Athole and Callander, Perthshire; Killarney, Kerry; Rostellan, Cork; Clonmel, Tipperary; Adare, Limerick; Killary Bay, Connemara, near Westport, Mallaranny and Dugort, Achill Isl., Mayo.

Form **parallela** Leight. Lich. Fl. 376 (1871). Thallus thin, greyish-white. Apothecia linear-elongate, arranged in parallel lines, straight or flexuose. Leight. Lich. Fl. ed. 3, 399. Var. *parallela* Mudd Man. 232 (1861).

Essicc. Bohl. n. 42; Leight. n. 245; Mudd n. 209.

A growth form rather than a variety.

Hub. On trees. *Distr.* Rather common in England, rarer in Scotland and Ireland.—*B. M.* Withiel, Cornwall; Torquay and Lustleigh, Devon; Tilgate and near Glynde, Sussex; near Lyndhurst, New Forest, Hants; Cirencester, Gloucestershire; Alfrick, near Worcester; Ulting, Essex; near Yarmouth, Norfolk; Ludlow, Shropshire; Cockshaw Bank, Cleveland, Yorkshire; Killarney, Kerry; Killary Bay, Connemara, Galway.

Var. **denigrata** Schaer. Enum. 153 (1850) (excl. syn.).—Thallus smooth, whitish, often determinate. Apothecia crowded together and forming black patches on the thallus.—Mudd Man. 232; Cromb. Lich. Brit. 98; f. *denigrata* Leight. Lich. Fl. 376; ed. 3, 398 (incl. f. *nigrata* and f. *hapalea* Leight. l. c. *Lichen denigratus* Ach. Lich. Suec. Prodr. 24 (1798). *Opegrapha stenocarpa* var.

hapalea Ach. Lich. Univ. 257 (1810)). *Hysterina denigrata* S. F. Gray Nat. Arr. i. 507 (1821).

Exsicc. Leight. n. 193; Mudd n. 210.

Hab. On trees.—*Distr.* Common throughout the British Isles.—*B. M.* New Forest and Netley Abbey, Hants; near Glynde and near Crawley, Sussex; Chalford, Gloucestershire; Malvern, Worcestershire; Epping Forest, Uting and Hadleigh Woods, Essex; Hindlip and near Wigmore, Herefordshire; Tong Priory, Shropshire; Barmouth, Merioneth; Llanrochwyn and near Llandudno, Carnarvonshire; I. of Man; near Ayton, Cleveland, Yorkshire; near Glasgow, Lanarkshire; Killarney, Kerry.

Var. *arthonoidea* Leight. ex Mudd Man. 232 (1861).—Apothecia variously difformed and flattened, crowded and confluent, forming irregular black masses, scattered or subparallel.—*F. arthonoidea* Leight. Lich. Fl. 377 (1871); ed. 3, 399. *Opegrapha nimbose* Sm. Engl. Bot. t. 2346 (1811)? (non Ach.).

Exsicc. Leight. n. 338; Johns. n. 461.

Hab. On trees.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Withiel, Cornwall; Newton Bushell and Ullacombe, near Bovey Tracey, Devon; Shanklin, I. of Wight; Saddlescomb and St. Leonards, Sussex; New Forest, Hants; Stokesay, Shropshire; Edderton, Montgomeryshire; Epping Forest, Essex; Cottishall, Norfolk; Conway, Carnarvonshire; Airyholme and Cliffrigg, Cleveland, Yorkshire; Chollerford, Northumberland; Swanston, near Edinburgh; Carrigaloe, Cork.

4. *O. atricolor* Stirton in Trans. Glasg. Soc. Nat. 1875, 89.—Thallus whitish, thin. Apothecia black, innate, sessile, narrow, somewhat acute, usually simple, internally blackish-grey or pallid brown; disc slit-like, becoming somewhat concave or even flattened, rugulose; hypothecium brownish-black; paraphyses somewhat indistinct, brown at the apices; spores 4–8 in the ascus, oblong-ovoid, 3-septate, colourless, 15–21 μ long, 4–5 μ thick; upper part of hymenium blue, the lower part yellow, becoming wine-red with iodine.—Leight. Lich. Fl. ed. 3, 400.

The species differs from *O. betulina* in the thin white thallus and in the very slender lirellæ; these characters may be due to the habitat—on decorticated wood. The lirellæ of most of the specimens are invaded by the yellow granules of a crustaceous *Placodium* (K + crimson). The crimson reaction had been noted by Stirton.

Hab. On decorticated wood.—*B. M.* Cader Idris and Dolgelly, Merioneth; near Altnaharra, Sutherland; Glenarm, Antrim.

5. *O. betulina* Sm. Engl. Bot. t. 2281 (1811) (non Pers.).—Thallus dull-yellowish, brownish or whitish, often limited by a dark line. Apothecia very prominent, sessile, mostly simple, elongate, the disc narrow, uniform; margins plump, rounded and incurved; hypothecium almost black, the hymenium usually clear and colourless; spores linear-obovate, colourless, 3-septate,

occasionally 4-septate, 17–23 μ long, 5–7 μ thick; spermogones with rod-shaped spermatia, 4–6 μ long, 2 μ thick.—Hook. in Sm. Engl. Fl. v. 145 (excl. syn.). *O. herbarum* Mont. in Arch. Bot. 302, t. 15, f. 1 (1833)? *O. atra* f. *herbarum* Leight. Lich. Fl. 377; ed. 3, 399. *O. Turneri* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 202, t. 5, f. 10 (1854) & Lich. Fl. 378; ed. 3, 400; Mudd Man. 231; Cromb. in Grevillea i. 173. *O. atrorimalis* Nyl. in Flora xlvii. 488 (1864); Cromb. Lich. Brit. 98.

Exsicc. Johns. n. 462; Larb. Lich. Hb. nos. 76, 109.

Forming a transition between *O. atra* and *O. varia*. The apothecia are stouter than in *O. atra*, and the spores broader and with a more distinct epispore, somewhat like those of *O. varia* in appearance, though smaller and usually 3-septate.

Hab. On trees, occasionally on palings.—*Distr.* Somewhat frequent in England, rarer in Scotland and Ireland, not recorded from the Channel Islands.—*B. M.* Lustleigh, Devon; near Lyndhurst, New Forest, Hants; Cirencester, Gloucestershire; near Lewes, near Steyning, Stanmer Park, Glynde, Beeding, Ardingly and Wakehurst, Sussex; Ulting, Hockley and Hadleigh Woods, and Epping Forest, Essex; Cader Idris, Merioneth; Malvern, Worcestershire; Babraham and Madingley Park, Cambridgeshire; Gopsall, Leicestershire; Thwaite St. George, Suffolk; Easby, Kildale, Ayton and Cliffrigg, Cleveland, Yorkshire; High Force, Teesdale, Durham; Lowther Park, Westmorland; Barcaldine, Argyll; Riverstown, Cork; Old Dromore, Killarney, Kerry; Glenarm, Antrim.

Form *lutescens* B. de Lesd. Lich. Dunk. Suppl. 134 (1914).—Apothecia powdered greenish-yellow; spores 3-septate 18–22 μ long, 6–8 μ thick. (The pruina appears also on the thallus.)

Hab. On bark. *B. M.* On holly, Wivelsecombe, Somerset. Comm. W. Watson.

6. *O. prosiliens* Stirton in Grevillea iii. 36 (1874).—Thallus white or whitish, thin. Apothecia black, prominent, ovate or oblong; disc narrow; margins rounded and prominent; spores fusiform-ellipsoid, colourless, 3-septate, with a colourless epispore, 20–28 μ long, 6–7 μ thick; spermogones with rod-like spermatia 4–6 μ long.—Leight. Lich. Fl. ed. 3, 403. Specimen not seen.

Evidently very close to *O. betulina*, but with longer spores.

Hab. On dead decorticated trees; near Grantown, Inverness-shire.

7. *O. saxicola* Ach. Syn. 71 (1814).—Thallus effuse, greyish or greenish, or rusty-brown or dark, thin, scurfy. Apothecia scattered, oblong or ovate, long or short, variously branched or diffused and angular; disc slit-like more or less expanded; margins tumid, rounded, incurved; asci slightly thickened at the apex, broadly clavate; spores ellipsoid or elongate-clavate, colourless, becoming brownish, 3-septate, 16–18 μ long or somewhat longer, 6–7 μ thick; spermogones with rod-like spermatia

4 μ long; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. 98; Leight. Lich. Fl. 378 pro parte; ed. 3, 401 pro parte. *O. rupestris* Pers. in Ust. Ann. Bot. xi. 20 (1794)?; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 91 (1854); Mudd Man. 228 pro parte.

Exsicc. Leight. n. 243.

The species is closely allied to *O. atra* and to *O. betulina*. In the specimen from Dinish the apothecia, as in *O. atra*, are occasionally invaded by the yellow granules of some crustaceous *Placodium*.

Hab. On siliceous or calcareous rocks.—*Distr.* Somewhat rare in the Channel Islands, N. England, Wales, N. Scotland, and S.W. Ireland.—*B. M.* Rozel and Boulay Bay, Jersey; Newton, Cleveland, Yorkshire; Nantgwynant, Snowdon, Trefriw and Llandudno, Carnarvonshire, Port Greenaugh, I. of Man; Carnforth, Lancashire; Levens, Westmorland; Thurso, Sutherland; Cloghan and Dinish, Killarney, Kerry; Achill Isl., Mayo.

Var. *Decandollei* Stiz. in Nov. Act. Acad. Leop. Carol. xxxii. 4, 26, t. 2, fig. 2 q-z (1865).—Thallus somewhat thicker than in the species, seldom absent, yellowish-green or greyish. Apothecia prominent, massed in small groups, or growing singly, linear-oblong or ovate, usually simple, obtuse at the extremities; spores elongate, rounded at the ends, 21–24 μ long, 5 μ thick.—Cromb. Lich. Brit. 98; Leight. Lich. Fl. 379; ed. 3, 401. *O. saxatilis* DC. Fl. Fr. ii. 312 (1805) (non Leight.). *O. saxigena* Tayl. in Mackay Fl. Hib. ii. 259 (1836); Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 93 (1854). *O. rupestris* var. *saxigena* Mudd Man. 229 (1861).

Exsicc. Leight. n. 311.

According to Bachmann (Nov. Act. Acad. Leop.-Carol. cv. 41 (1920)) the hyphæ of the lichen on limestone have been traced to a depth of about 2 mm.

Hab. On rocks, chiefly calcareous.—*Distr.* Not common in the Channel Islands, N. England, Wales, Scotland and S. and W. Ireland.—*B. M.* Island of Sark; near Ayton, Cleveland, Yorkshire; Cader Idris, Barmouth, Merioneth; Snowdon and Capel Curig, Carnarvonshire; West Water, Fifehire; Appin, Argyll; Dunkerron, Killarney, Kerry; Kilkee, Clare; Lettermore and Kylemore, Connemara, Galway; Lough Dan, Wicklow.

Form *clarescens* A. L. Sm. Differs from the variety in the more continuous greenish-white thallus and in the more regularly scattered short apothecia.—*O. saxigena* f. *clarescens* Nyl. in Flora lxii. 224 (1879); Cromb. in Grevillea viii. 30 (1879).

Exsicc. Larb. Lich. Hb. n. 79.

Hab. On rocks.—*Distr.* Rare in W. Scotland and W. Ireland.—*B. M.* Isle of Lismore, Argyll; Twelve Pins and Kylemore, Connemara, Galway.

Var. *Persoonii* Stiz. *tom. cit.* 30, t. 2, f. 2, ρ and σ .—Thallus thin, whitish or greyish. Apothecia oblong, small, often deformed;

spores colourless, 3-septate, 21–23 μ long, 5–6 μ thick.—Cromb. Lich. Brit. 98; Leight. Lich. Fl. 380; ed. 3, 403. *Lichen Persoonii* Ach. Lich. Suec. Prodr. 109 (1798).

Hab. On rocks.—*Distr.* Rare in N. England, N. Scotland and W. Ireland.—*B. M.* Whitbarrow and Cunswick Sear, Westmorland; Craig Tulloch, Perthshire; Kilkee, Clare.

Var. *gyrocarpa* Stiz. *tom. cit.* 29, t. 2, f. 2, e–o.—Thallus greyish, limited and intersected by black lines. Apothecia scattered, sessile, roundish, shortly ellipsoid or deformed, rarely linear; spores 20–25 μ long, 4–6 μ thick.—Cromb. l. c.; Leight. l. c. *O. gyrocarpa* Flot. in Flora viii. 345 (1825). *Verrucaria umbrosa* Tayl. in Mackay Fl. Hib. ii. 97 (1836).

Ersicc. Johns. n. 515.

Distinguished by the intersecting lines of the thallus and by the usually deformed apothecia. Stizenberger (*l. c.*) states that the spores are 2-celled or up to 7-celled. This condition has not been verified in the British specimens. The spores are, however, difficult to find in this variety.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, S. England, N. Scotland and S. and W. Ireland.—*B. M.* Noirmont, Jersey; Luccombe, I. of Wight; Cirencester, Gloucestershire; Llyn Gwernon, Merioneth; Carig Mt., Mangerton, Kerry; Adragool, Kylemore, Connemara, Galway.

8. *O. atrula* Nyl. in Flora lx. 565 (1877).—Thallus very scanty. Apothecia black, short, oblong, simple, prominent, arranged in a somewhat parallel manner; disc narrow; spores colourless, fusiform-oblong, 3-septate, about 16 μ long, 3.5 μ thick.—Cromb. in Grevillea vi. 113; Leight. Lich. Fl. ed. 3, 400.

Ersicc. Larb. Lich. Hb. n. 39.

The only specimens in the British Museum are imperfect and without asci or spores; the apothecia are small and rather thickly scattered over the substratum.

Hab. On mica-schist stones in shady places.—*B. M.* Kylemore, Connemara, Galway (the only locality).

Var. *hysteriiformis* Cromb. in Journ. Bot. xx. 276 (1882).—Thallus greyish, thin or obsolete. Apothecia larger and more prominent than in the species, and the margins sometimes furrowed; spores colourless, 3–5-septate, 15–16 μ long, 3–4 μ thick.—*O. hysteriiformis* Nyl. in Flora lxii. 224 (1879); Cromb. in Grevillea viii. 30 (1879).

Hab. On rocks by the sea.—*B. M.* Kylemore, Connemara, Galway (the only locality).

9. *O. grumulosa* Duf. in Journ. Phys. lxxxvii. 214 (1818).—Thallus white, thick, farinose (Kf + yellow, CaClf + red). Apothecia black, at first immersed, then sessile, ellipsoid, roundish,

elongate or angular; disc bluish-pruinose; margins thin, prominent, persistent; hypothecium thick, black; paraphyses thickish, shortly branched above and somewhat conglutinate; spores colourless, oblong-fusiform, 3-septate, 15–17 μ long, 3–4 μ thick.—Leight. Lich. Fl. 380; ed. 3, 403 & in Grevillea ii. 171, t. 26, f. 2 (1874).

Apt to be confused with *Lecanactis Dilleniana*, but with a much thicker thallus, and more graphideine apothecia. The reaction with CaCl on our specimens is very faint.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, S. England and W. Scotland.—*B. M.* Near Rozel, Jersey; Walls of Old Nunnery, Alderney; Lynton and Lynmouth, Devon; I. of Portland, Dorset; Millport, I. of Cumbrae.

10. *O. nothiza* Nyl. in Flora lxxx. 13 (1880).—Thallus greyish, thin and firm, cracked into small areolæ on a blackish almost obsolete hypothallus. Apothecia black, oblong, roundish or angular; disc plane, usually bluish-pruinose; margins thin, prominent, disappearing; hypothecium thick, brownish-black; paraphyses thickish, shortly branched above and somewhat conglutinate; spores oblong, 3-septate, colourless, 15–17 μ long, 3–4 μ thick.—Cromb. in Grevillea viii. 113 & in Journ. Bot. xx. 276 (1882). *O. varia* f. *notha* (saxicolous). Leight. Lich. Fl. 381; ed. 3, 404 (see Larb. *exsicc.* n. 317).

Exsicc. Larb. Lich. Hb. n. 317 & Lich. Cæsar. n. 91.

Perhaps only a growth form of the preceding, which it strongly resembles, differing chiefly in the thin grey areolate thallus and the less distinctly pruinose apothecia.

Hab. On rocks.—*Distr.* Rare in the Channel Islands.—*B. M.* La Coupe, East Coast, Jersey; Moulin Huet Bay, Sark.

11. *O. calcarea* Turn. in Sm. Engl. Bot. t. 1790 (1807); Ach. Lich. Univ. 250 (1810).—Thallus white or yellowish, tartareous, sometimes very thin and pulverulent. Apothecia linear-elongate, black, simple, curved, flexuose and wavy, usually conglomerate in small crowded swards, sometimes scattered, shining; disc slit-like, rather open; paraphyses crowded, slender, subdiscrete; asci broadly clavate with a thick wall at the tip; spores somewhat clavate, colourless, sometimes becoming brownish, 3-septate, 14–19 μ long, 4–6 μ thick.—*O. saxatilis* Fr. Lich. Eur. 366 (1831), pro parte (non DC.); Hook. in Sm. Engl. Fl. v. 145 pro parte; Tayl. in Mackay Fl. Hib. ii. 106. *O. Chevallieri* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 90, t. 5, f. 4 (1854) (excl. syn.); Mudd Man. 228 (excl. syn.). *O. atra* var. *calcarea* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxii. 4, 18, t. 1, f. 5, a–d (1865); Cromb. Lich. Brit. 98; var. *Chevallieri* Stiz. l. c. 20, t. 1, f. 5, t–z; Cromb. l. c. *O. saxicola* var. *Chevallieri* Leight. Lich. Fl. 379; ed. 3, 402. *Hysterina calcarea* S. F. Gray Nat. Arr. i. 505 (1821).

Exsicc. Leight. nos. 67, 242; Mudd n. 203; Larb. Lich. Hb. n. 275.

Differs from *O. confluens* in the white and usually more developed thallus, the more crowded lirellæ, the conglutinate paraphyses and the thick apex of the ascus.

Hab. On rocks mostly calcareous or arenaceous, rarely on clay soil.—*Distr.* General throughout the Channel Islands and England, rarer in Scotland and Ireland.—*B. M.* St. Ouen's Bay, Jersey; Bodmin, Cornwall; Kingsbridge and Torquay, Devon; Ventnor, I. of Wight; Ardingly, Hastings and Keymer Church, Sussex; near Cirencester, Gloucestershire; Bathampton, Somerset; Hereford; Leigh Court, Worcestershire; Yarmouth, Norfolk; Giltar Point, Tenby, Pembrokeshire; Aberdovey, Merioneth; Holyhead, Anglesea; Great Orme's Head, Carnarvon; Castell-Dinas-Bran, Denbighshire; Parson Drove, Cambridgeshire; Collingham, Ayton and Roseberry, Cleveland, Yorkshire; Arnbarrow, Westmorland; North Berwick; Bay of Nigg, Kincardineshire; Thurso, Sutherland; Kilbarrick Church, near Dublin; Ross and Kilkee, Clare; Glenarm, Antrim; Louisburgh and Achill Isl., Mayo.

Form **heteromorpha** A. L. Sm.—Thallus almost obsolete. Apothecia more scattered than in the species and the groups smaller, rather large and prominent, simple or sometimes branched; internal structure similar.—*Opegrapha atra* var. *Chevallieri* f. *heteromorpha* Stiz. tom. cit. 21, t. 1, f. 5, a-ξ. *O. atra* f. *heteromorpha* Cromb. Lich. Brit. 98 (1870). *O. saricola* var. *Chevallieri* f. *heteromorpha* Leight. Lich. Fl. ed. 3, 402.

Exsicc. Larb. Lich. Hb. n. 77.

Hab. On maritime rocks.—*Distr.* Rare in the Channel Islands, S. England, E. and W. Scotland and S. and W. Ireland.—*B. M.* Port Moulin, Sark; Noirmont, Jersey; Wembury, Devon, Aberdovey, Merioneth; I. of Man; Arnside, Westmorland; Bay of Nigg, Kincardineshire; near Peterhead, Aberdeenshire; Barcaldine, Argyll; Old Head of Kinsale, and Rostellan, Cork; Twelve Pins and Killary, Connemara, Galway.

12. *O. confluens* Stiz. in Flora xlviii. 75 (1865).—Thallus greyish-green, effuse, thin or wanting. Apothecia usually grouped in little masses, rarely solitary and scattered; sessile simple, rather thick, cylindrical, straight or curved and contorted; disc slit-like, becoming somewhat open, the margins rounded, inflexed, becoming acute; paraphyses discrete, slightly swollen and brown at the tips; spores colourless, elongate-ovate, 3-septate, 16–24 μ long, 4–6 μ thick.—Cromb. Lich. Brit. 99; Leight. Lich. Fl. 378; ed. 3, 401.

Exsicc. Cromb. n. 195.

Differs from the preceding in the almost constant absence of thallus, the grouping of the lirellæ, the more lax character of the paraphyses and the thinner walled asci at the tips.

Hab. On rocks.—*Distr.* Rather rare throughout the British Isles. —*B. M.* I. of Wight, near Cirencester, Gloucestershire; Aberdovey,

Merioneth; Ayton, Cleveland, Yorkshire; Peel, I. of Man; Achosragan, Appin, Argyll; Ben Lawers and Craig Tulloch, Blair Athole, Perthshire; I. of Unst, Shetland; Dinish Island, Killarney, Kerry; Lettermore, Connemara, Galway.

13. *O. xanthodes* Nyl. in Flora lxi. 245 (1878).—Thallus yellow or yellowish-grey, thin, rather smooth, cracked into minute areolæ. Apothecia minute, oblong, black with a narrow disc; hypothecium black; paraphyses upright, crowded; spores fusiform-oblong, 3- sometimes 4-septate, colourless, 15–18 μ long, 5–6 μ thick; hymenial gelatine wine-red with iodine; spermatia straight, 4 μ long, 1 μ thick.—Cromb. in Grevillea vii. 97; Leight. Lich. Fl. ed. 3, 404.

Well characterized by the areolate thallus and the minute scattered apothecia.

Hab. On rocks.—*B. M.* Kylemore, Connemara, Galway (the only locality).

Spores 5–7-septate.

14. *O. paraxanthodes* Nyl. in Flora lxii. 357 (1879).—Thallus pale-yellow or pale-greenish, thin, minutely cracked-areolate. Apothecia minute, oblong or linear-oblong, disc slit-like; spores fusiform-oblong, 5- (sometimes 4-) septate, 23–25 μ long, 8–9 μ thick; hymenial gelatine tawny-wine-reddish with iodine; spermatia straight, 5–7 μ long, .6 μ thick.—Cromb. in Grevillea viii. 113 (1880).

Exsicc. Larb. Lich. Hb. without number.

Similar to *O. xanthodes*, but distinguished by the larger spores.

Hab. On shady calcareous rocks.—*B. M.* Near Tintern, Monmouthshire (comm. H. H. Knight); Achnanure, Galway.

15. *O. varia* Pers. in Ust. Ann. Bot. vii. 30 (1794).—Thallus effuse, whitish, pulverulent, thin. Apothecia prominent, black, sessile, roundish-oblong, elliptical, or elongate, often attenuate at each end; the margins prominent, rather thin and inflexed or often disappearing; the disc forming a narrow slit or dilated and plane, sometimes almost convex; hypothecium dark-brown; paraphyses slender, wavy and branched, involved above in a brown mucilage; spores irregularly ovate-fusiform, usually 5-septate, colourless or becoming brownish, rather large, 20–30 μ long, 7–9 μ thick.—Hook. in Sm. Engl. Fl. v. 145 (excl. syn. *O. lichenoides* & *O. notha*); Tayl. in Mackay Fl. Hib. ii. 106 (excl. syn. Engl. Bot. t. 1890 & *O. notha*); Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 94, t. 5, f. 9 (1854) (incl. vars. *pulicaris* Fr. Lich. Eur. 364 (1831), *diaphora* Fr. l. c. 365, *tigrina* Schær. Enum. 157 (1850) & *tridens* Schær. tom. cit. 158) & Lich. Fl. 381; ed. 3, 404 (incl. ff. *pulicaris*, *diaphora*, *tigrina* and *tridens*); Mudd Man., 229 (incl. vars. *pulicaris*, *signata* (Fr. l. c.), *tigrina* f. *tridens* Mudd, & *diaphora*); Cromb. Lich. Brit. 97 pro parte. *O. diaphora*

Ach. Meth. 19 (1803); Engl. Bot. t. 2280; *O. signata* var. *tigrina* Ach. Lich. Univ. 262 (1810). *Lichenoides crusta tenuissima, peregrinis velut litteris inscripta*. Dill. Hist. Musc. 125. t. 18, f. 1.A. (1741). *Lichen scriptus* var. *pulicaris* Lightf. Fl. Scot. ii. 801 (1777). *L. pulicaris* Hoffm. Enum. Lich. 14, t. 3, f. 2, f. (1784)? *L. diaphorus* Ach. Lich. Suec. Prodr. 20 (1798). *L. signatus* Ach. l. c. 23. *Alyxoria diaphora* S. F. Gray Nat. Arr. i. 504 (1821).

Exsicc. Bohl. n. 52; Mudd n. 205; Leight. n. 287; (in last two as *O. varia*, var. *tigrina*).

A very variable species in the form and size of the apothecia, giving rise to numerous varieties which appear to be only forms or stages of growth that are frequently represented side by side on the same specimen. When the apothecia are rather small with the ends rounded or tapering and the margins persistent and incurved, it is f. *pulicaris*; the apothecia are more elongate and obtuse in f. *tigrina* (Engl. Bot. t. 2280), while in f. *diaphora* the margins tend to disappear, the disc becoming rather wide and flat or slightly convex. Usually the apothecia are simple, straight or bent and numerous, lying in all directions, sometimes they are stellately arranged (f. *tridens*).

Lichen pulicaris Hoffm., though professedly based on Lightfoot's variety, is doubtful and incomplete both in description and figure. Some recent lichenologists have rejected the name *varia*, substituting as species *O. pulicaris*, *O. diaphora* and *O. notha*. The microscopic characters of the apothecia are alike in all; in *O. diaphora* the spermatia are described as slightly shorter and thicker, 3-4 μ long, 2 μ thick; in *O. pulicaris* as 4 μ long and 1 μ thick (*vide* Nyl. Lich. Par. 104-5 (1896)).

Hab. On trees.—*Distr.* Common in England and the Channel Islands, rarer in Scotland and Ireland.—*B. M.* Jersey; Appuldurcombe, I. of Wight; Lustleigh, Devon; New Forest, Hants; near Shermanbury, Gravely, Wiston, Wakehurst Park, and St. Leonards, Sussex; Canterbury, Kent; Reigate, Surrey; near Millhill, Middlesex; Quendon and Ulting, Essex; Hollybush Hill, Malvern, Little Malvern and Norton, Worcestershire; Birkland, Nottinghamshire; Nesscliff, Shropshire; Builth, Breconshire; Stanton Park, Derbyshire; Ingleby and Kildale, Cleveland, Yorkshire; Lowther Park, Westmorland; Craigforth, near Stirling; Blair Athole, Perthshire; Ardum Demesne, Cork; Ballynagarde, Limerick; Westport, Mayo.

Var. *lutescens* Mudd Man. 230 (1861).—Margins of apothecia greenish or yellowish pruinose, otherwise similar to the species.—*F. ochrocheila* Leight. Lich. Fl. ed. 3, 406 (1879). *O. vulvella* var. *lutescens* Ach. Syn. 77 (1814).

As in *O. betulina* f. *lutescens* the yellow pruina appears also on the thallus and seems to be of gonidial origin, possibly due to growth conditions.

Hab. On trees and branches.—*Distr.* N. England and W. Ireland.—*B. M.* Ayton and Ingleby, Cleveland, Yorkshire; Doughruagh Mt., Connemara, Galway.

Var. *notha* Fr. Lich. Eur. 364 (1831).—Apothecia oblong or roundish, difform, small or large, disc plane or convex, the

margins often obliterated, otherwise as in the species.—Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 95 (1854); Mudd Man. 230; f. *notha* Cromb. Lich. Brit. 97 (1870); Leight. Lich. Fl. 381 (lignicolous); ed. 3, 404. *Lichen nothus* Ach. Lich. Suec. Prodr. 19 (1798). *Opegrapha notha* Ach. Meth. 17 (1803) pro parte; Sm. Engl. Bot. t. 1890; Grev. Fl. Edin. 352. *Alyxoria notha* S. F. Gray Nat. Arr. i. 504 (1821).

Exsicc. Johns. n. 463; Leight. n. 66.

Connected with the species by intermediate forms, but generally distinguished by the broader and more rounded apothecia.

Hab. On trees; rarely on old palings.—*Distr.* Coextensive with the species.—*B. M.* Lustleigh, Devon; near Bartley Lodge, New Forest, Hants; Millhill, Middlesex; Epping Forest and Ulting, Essex; Fishguard, Pembrokeshire; Malvern and Tibberton, Worcestershire; Bardon Hill, Leicestershire; Montford Bridge, near Shrewsbury and Llanbyodwell, Shropshire; Llangollen, Denbighshire; near Yarmouth, Norfolk; Bilsdale, Ayton and near Guisbrough, Cleveland, Yorkshire; Levens and Lowther Park, Westmorland; Teesdale, Durham; Killin, Perthshire; Muckross Demesne, Killarney, Kerry; Rostellan, near Cork; Adare and near Limerick; near Ballinakill, Connemara, Galway.

Var. *rimalis* Fr. Lich. Eur. 365 (1831).—Apothecia short or elongate, simple, straight or flexuose, narrow; disc narrow; margins elevated, inflexed; spores usually 5- sometimes 4-septate. —Mudd Man. 231 pro parte; subsp. *rimalis* Cromb. Lich. Brit. 97 (1870); f. *rimalis* Leight. Lich. Fl. 383 (1871); ed. 3, 406; *O. rimalis* Ach. Lich. Univ. 260 (1810); Carroll in Nat. Hist. Rev. vi. 531 (1859). *O. varia* f. *herbicola* Leight. Lich. Fl. ed. 3, 406 (1879). *O. diaphora* var. *herbicola* Nyl. in Flora lx. 463 (1877).

Exsicc. Leight. n. 192; Mudd n. 207.

Some of the lirellæ as in var. *lutescens* are yellowish-pruinose.

Hab. On trees, shrubs or ferns; rarely on wood.—*Distr.* Common and coextensive with the species.—*B. M.* Withiel, Cornwall; Crawley, Sussex; Epping Forest and Stansted Mountfitchet, Essex; Dolgelly, Merioneth; Gopsall, Leicestershire; Kildale and Airyholme Wood, Cleveland, Yorkshire; Malvern, Worcestershire; Ben Lawers and Craig Tulloch, Blair Athole, Perthshire; Carrigogunnel, Limerick; Doughruagh Mt., Connemara, Galway.

16. *O. vulgata* Ach. Meth. 20 (1803).—Thallus effuse, membranaceous, smooth or cracked and scaly, sometimes pulverulent, greyish-white or brownish. Apothecia prominent, scattered or crowded, varying in size, short and roundish or oblong, or elongate, slender, linear, sometimes bent and wavy, occasionally branched; disc narrow, uniform; margins round, inflexed; hypothecium dark-brown, paraphyses slender, branched above; epithecium brown; spores colourless, elongate, narrowly fusiform, 5-7-septate (rarely 9-septate?), 15-29 μ long, 2-4 μ thick, usually about 25-27 μ long, 3 μ thick; spermatogones with curved slender spermatia, 14-16 μ long or shorter, 1 μ thick.—Engl. Bot. t.

1811; Hook. Fl. Scot. ii. 43 & in Sm. Engl. Fl. v. 145; Grev. Fl. Edin. 352; Tayl. in Mackay Fl. Hib. ii. 106; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 207, t. 5, f. 13a (excl. ff. *lithyrga* and *steriza*, incl. var. *stenocarpa* Leight. l. c. 209, f. 13, 1a (1854)) & Lich. Fl. 383; ed. 3, 406 (incl. f. *stenocarpa*); Mudd Man. 232 (incl. vars. *stenocarpa* Leight. & *dubia* Mudd); Cromb. Lich. Brit. 99 (excl. f. *lithyrga*). *O. stenocarpa* Ach. Lich. Univ. 257 (1810) pro parte. *O. amphotera* Nyl. in Flora xlix. 374 (1866); Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. 406 (1867) & Lich. Fl. 386; ed. 3, 410; Cromb. Lich. Brit. 99. *O. divulgata* Nyl. in Flora lxii. 358 (1879); Cromb. in Grevillea viii. 113. *Lichen vulgatus* Ach. Lich. Suec. Prodr. 21 (1798) (excl. syn.). *Hysterina vulgata* Gray Nat. Arr. i. 506 (1821).

Ersice. Bohl. n. 127; Leight. nos. 194, 312 (as *O. dubia* Leight.), 381; Mudd n. 211; Larb. Lich. Hb. 110; Johns. n. 464.

Distinguished from the preceding species by the form of the spores, which show considerable variation in length and septation according to the stage of development. The apothecia vary greatly in size, being sometimes very long and numerous (f. *stenocarpa*), though usually both short and long fruits occur on the same specimen. The thallus, usually brownish-green, is greyish and continuous when it occurs on pines (*O. amphotera* Nyl.). (See *Verrucaria niveoatra*, p. 322, for spermogones.)

Hab. On the bark of trees; rarely on wood.—*Distr.* Frequent in the Channel Islands, England and Ireland; somewhat rare in Scotland, though probably overlooked.—*B. M.* Rozel Manor, Jersey; Withiel and near Penzance, Cornwall; Torquay, Devon; New Forest, Hants; Woolsenbury, Saddlecomb, Mount Harry, Hayward's Heath, Wivelsfield, Charlton Forest and near Plumpton, Sussex; Brasted, Kent; Northampton; Twyercross, Leicestershire; Suffolk; Sutton, Haughmond Hill and near Shrewsbury, Shropshire; Mundon, Chalkney Woods, Hadleigh Woods, Ulting and Epping Forest, Essex; Worcestershire; Coltishall and Yarmouth, Norfolk; Madingley Park, Cambridgeshire; Easby Wood and Ayton, Cleveland, Yorkshire; Monmouth; Dolgelly, Merioneth; Trefriw, Gwydir Woods, Bettws-y-Coed and Bryn Maelgwyn, Carnarvonshire; L. of Man; Levens Park, Westmorland; Eskdale, Cumberland; Airds, Appin, Argyll; Killin and near Callander, Perthshire; Deer Park, Castlemartyr and near Cork, Blackwater Bridge, Dinish, Tore Mt., Deer Park and Derryunihy, Killarney, and Glencar, Kerry; Castleconnel and Carrigogunnell, Limerick.

Var. *siderella* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 131 (1857) & in Act. Soc. Linn. Bord. sér. 3, i. 405 (1856).—Thallus usually smooth. Apothecia narrow, often slightly flattened, growing in more or less radiate-stellate groups; spermogones with shorter slightly-bent or straight spermatia 3–6 μ long, 1 μ thick.—Mudd Man. 233. Var. *subsiderella* Nyl. Lich. Scand. 255 (1861); Cromb. Lich. Brit. 99; f. *subsiderella* Leight. Lich. Fl. 385 (1871); ed. 3, 407. *O. hapaleoides* Nyl. in Flora lii. 296 (1869)? Cromb. in Journ. Bot. xi. 135 (1873); Leight. Lich. Fl. ed. 3, 408. *Lichen siderellus* Ach. Lich. Suec. Prodr. 24 (1798)?

Ersice. Mudd n. 212; Larb. Lich. Hb. n. 78 (as *O. hapaleoides*).

Hab. On bark of trees.—*Distr.* Somewhat rare throughout Great Britain.—*B. M.* Near Lustleigh, Devon; near Brockenhurst, New Forest, Hants; Hawbridge, Somerset; near Lewes, near Poynings Springs, Beeding and Blatchington, Sussex; Theydon, Broomfield and Bocking, Essex; Alfrick and Norton, and near Claines, Worcestershire; Dolgelly, Merioneth; Easby, Cleveland, Yorkshire; Nannau, Dolgelly, Merioneth; I. of Man; Barcaldine, Argyll; Kenmore, Perthshire; Carrigaloe, near Cork, Muckross Demesne, Killarney, Kerry; Doughruagh Mt., Glendalough and Kylemore, Connemara, Galway.

17. *O. areniseda* Nyl. in Flora lviii. 446 (1875).—Thallus scarcely visible. Apothecia black, linear, very long, massed in small heaps; disc narrow; hypothecium blackish-brown; paraphyses slender, branched, conglutinate; spores colourless, fusiform, 3-5-septate, up to 30 μ long, 4-6 μ thick; spermogones heaped in small groups, with straight spermatia, 3.5-4.5 μ long, 1 μ thick.—Cromb. in Journ. Bot. xiv. 362 (1876); Leight. Lich. Fl. ed. 3, 406. *O. actophila* Nyl. in Flora lxiii. 13 (1880); Cromb. in Grevillea viii. 113 & in Journ. Bot. xx. 276 (1882).

Nylander gives spore measurements as 14-16 μ long; when fully developed, however, they measure from 20-30 μ in length, and are usually 5-septate.

Hab. On sandy soil and old wood.—*Distr.* Very rare in the Channel Islands (Jersey).—*B. M.* On sandy soil: Noirmont and Belcoute Bay; on decayed rafters: St. John's, Jersey; I. of Man.

18. *O. zonata* Koerb. Syst. Lich. Germ. 279 (1855).—Thallus reddish or reddish-brown, thin, subtartareous, smoothish, with numerous yellowish-white soredia, often limited and intersected by raised blackish lines formed by the hypothallus. Apothecia small, brownish-black, scattered, shortly oblong or round, the margins elevated, often resembling the perithecium of a *Verrucaria*; hypothecium subtended by a thinnish black line, colourless or brownish; paraphyses conglutinate; spores elongate-fusiform, 5-septate, 16-22 μ long, 3-4 μ thick.—Leight. Lich. Fl. ed. 3, 408. *Verrucaria horistica* Leight. Lich. Fl. 451 (1871); ed. 3, 482 & in Grevillea i. 60, t. 4, f. 1.

Exsicc. Johns. n. 438.

Well characterized by the presence of soredia, and usually by the numerous, prominent, intersecting black lines. The spores vary from 3- to 5-septate, sometimes on the same specimen, though usually only one or the other number of septa are present.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, N. Wales and N. England.—*B. M.* Port Gorey, Sark; Boulay Bay, Jersey; Cader Idris, Merioneth; Llyn Cowlyd, near Capel Curig, Bettws-y-Coed and Trefriw, Carnarvonshire; above Scroggs Bridge, Staveley, Oxenholme and Ravensborough Crag, Westmorland; near Bassen-thwaite, Cumberland; Glendalough, Wicklow.

19. *O. cæsariensis* Nyl. in Flora li. 477 (1868).—Thallus white, indeterminate, thin, often only slightly developed.

Apothecia prominent, cylindrical, simple, subflexuose about 1 mm. in length; disc slit-like; paraphyses conglutinate; hypothecium and epithecium dark-brown or blackish; spores oblong-fusiform, colourless, 5-septate, 17–21 μ long, 4 μ thick.—Cromb. Lich. Brit. 99; Leight. Lich. Fl. 383; ed. 3, 406.

Exsicc. Larb. Lich. Hb. n. 353.

Hab. On quartzose rocks.—*Distr.* Rare in the Channel Islands and S. England.—*B. M.* Sark; near Rozel, La Coupe, Noirmont and L'Étaq (?), Jersey; the Lizard and Pentire, St. Minver, Cornwall.

20. *O. lithyrgea* Ach. Lich. Univ. 247 (1810) pro parte & Syn. 72 (1814) (incl. var. *steriza*).—Thallus greenish-grey, dark-coloured, or whitish, sometimes wanting. Apothecia roundish, elongate-ovoid or usually elongate and slender, simple or sometimes divided, rarely stellately arranged or in groups; disc narrow; margins incurved; paraphyses slender, distinct, not discrete; spores narrow, fusiform, colourless, 5–7-septate, 20–28 μ long, 3, rarely 4–5 μ thick; spermatogones with straight or slightly-bent spermatia, 4–5 μ long, 1 μ thick.—*O. vulgata* var. *lithyrgea* Nyl. Lich. Scand. 255 (1861); f. *lithyrgea* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxii. 4, 7, t. 1, f. 2 (1865); Cromb. Lich. Brit. 99; Leight. Lich. Fl. 385; ed. 3, 408; f. *steriza* Leight. *ll. c.*

Exsicc. Larb. Lich. Hb. nos. 318, 354 & Lich. Cæsar. n. 42, 43?

Distinguished by the usually slender thread-like apothecia and by the narrow spores resembling those of *O. vulgata*.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, Central England and S. and W. Ireland.—*B. M.* St. Brelade's Bay and Noirmont, Jersey; Cloghan, Killarney, Kerry.

21. *O. lithyrgodes* Nyl. in Flora lviii. 106 (1875).—Thallus greyish-brown, thin, continuous. Apothecia minute, scattered, shining-black, sessile, oblong or linear-oblong; disc narrow; margins thickish, round, inflexed; spores elongate, fusiform, 3–7-septate, 32 μ long, 6 μ thick; spermatogones with arcuate spermatia.—Leight. Lich. Fl. ed. 3, 409.

Exsicc. Larb. Lich. Hb. n. 191.

Somewhat similar to the preceding in the form and septation of the spores, but differing in the thallus and in the constantly minute apothecia. Spores occasionally measure 20 $\mu \times 3$ –5 μ .

Hab. On rocks.—*Distr.* Rare in W. Ireland.—*B. M.* Lough Muck, Connemara, Galway.

22. *O. Leightonii* Cromb. ex Leight. Lich. Fl. 385 (1871).—Thallus effuse, varying in thickness, pulverulent, greyish-green or chalky-white, sometimes wanting. Apothecia prominent, linear-elliptical, usually rather long and stout, straight or flexuose, simple or occasionally forked; disc becoming somewhat

expanded and naked or greyish-pruinose; margins at first thick and elevated, becoming thinner; spores subclavate, fusiform, colourless, sometimes becoming brownish, straight or bent, 5-7-septate, usually 6-septate, the central cell somewhat larger, 25-31 μ long, 5-6 μ thick.—Leight. *op. cit.* ed. 3, 409. *O. saxatilis* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 89, t. 5, f. 3 (1854) (excl. syn.) (non DC.); Mudd Man. 227 (excl. syn.).

Exsicc. Johns. n. 465; Mudd n. 202.

Easily distinguished by the form and septation of the spores. When well-developed, it is one of our most beautiful species, the prominent black fruits being in striking contrast with the light-coloured thallus. The apothecia are sometimes few and scattered or numerous and lying in all directions, often arranged in a substellate manner.

Hab. On calcareous and sandstone rocks.—*Distr.* Rather uncommon throughout England, rare in Ireland, not yet recorded for Scotland.—*B. M.* Saltash, Cornwall; Ilsham, Torquay, Devon; Fulking, Sussex; Duntisborne and Barnsley Park, Gloucestershire; Netley Abbey, Hants; Donnington Castle, Berks; The Bartons near Ledbury, Herefordshire; Bartlow Church, Essex; Aberdovey, Merioneth; Earl's Barton, Northamptonshire; Newton Wood, Cleveland, Yorkshire; Whitbarrow, Westmorland; St. Bees, Cumberland; Killarney, Kerry.

Spores 7- to multi-septate.

23. *O. lyncea* Borr. ex Hook. in Sm. Engl. Fl. v. 144 (1833).—Thallus white, tartareous, pulverulent, unequal. Apothecia black, immersed, oblong or linear-oblong, short or elongate, simple, curved, the disc open, plane, bluish-grey-pruinose; margins stout, elevated, wavy; paraphyses indistinct; spores elongate-fusiform, colourless, about 7-septate, 22-30 μ long, 4 μ thick; spermogones with oblong spermatia 4 μ long, 1 μ thick.—Mudd Man. 229; Cromb. Lich. Brit. 100; Leight. Lich. Fl. 386; ed. 3, 409. *Lichen lynceus* Sm. Engl. Bot. t. 809 (1800). *Arthonia lyncea* S. F. Gray Nat. Arr. i. 479 (1821). *Lecanactis lyncea* Eschw. Syst. Lich. 14, f. 7 (1824); Fr. Lich. Eur. 375 (1831); Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 391 (1854).

Exsicc. Bohl. n. 93; Leight. n. 195; Mudd n. 204; Larb. Lich. Hb. n. 111.

Easily recognized by the whitish thallus which sometimes spreads over large patches of the bark, and by the grey-pruinose apothecia. These are occasionally attacked by a fungus which changes them into a disintegrated blackish mass. This condition—*Spiloma versicolor*, Sm. Engl. Bot. t. 2076, *S. variolosum* t. 2077 (1809)? Turn. & Borr. Lich. Brit. 35 (1839) as vars. of *S. nigrum* pro parte?; Hook. in Sm. Engl. Fl. v. 166 (1833)—was named by Fries *Lecanactis lyncea* var. *spilomatia* (Lich. Eur. 376), and later by Nylander *Spilomium graphideorum* (in Act. Soc. Linn. Bord. sér. 3, i. 398 (1856)). A form with very short lirellæ has been identified by Nylander (Lich. Par. 109 (1896)) as identical with *Lecanactis stictica* Dur. & Mont, Fl. d'Algér, 282 (1846).

The specimen in the Crombie herbarium was collected at Holmwood, Surrey.

Hab. On old oaks. — *Distr.* Rather rare in the Channel Islands and England. — *B. M.* Brockenhurst, New Forest, Hants; near Glynde, Danny, Hurstpierpoint, Parham Park, Sussex; Holmwood and Shere, Surrey; Thorndon Hall, Gostfield Hall, and Epping Forest, Hainault Forest, Essex; Penshurst, Kent; Windsor Forest, Berks; Ickworth Park and Dennington Park, Suffolk; Sherwood Forest, Nottinghamshire; Purton, Wiltshire; Packington Park, Warwickshire; Donnington Park, Leicestershire; Haughmond Hill, Shropshire; Hoggarts Wood, Ingleby, Cleveland, Yorkshire.

24. *O. prosodea* Ach. Meth. 22 (1803). — Thallus effuse, thickish, membranaceous, dull-pallid-brownish. Apothecia prominent, stout, subcylindrical, somewhat shining, straight; disc narrow; margins elevated, connivent; paraphyses distinct; spores elongate-fusiform, colourless, up to 17-septate, about $50-60\ \mu$ or more long, $6\ \mu$ thick; spermogones rod-shaped $5-6\ \mu$ long, $7\ \mu$ thick. — Nyl. in Prodr. Fl. N. Gran. 568; Cromb. Lich. Brit. 99; Leight. Lich. Fl. 387; ed. 3, 410.

Exsicc. Larb. Cæsar. n. 92.

Hab. On bark of trees. — *Distr.* Rare in Channel Islands and S. England. — *B. M.* Ann Port and St. Peter's Valley, Jersey; near Penzance, Cornwall; Newton Bushell, Devon; New Forest, Hants; Shere, Surrey.

25. *O. viridis* Pers. ex Ach. Meth. 22 (1803). — Thallus pale-yellowish or brownish, thin, somewhat vaguely limited. Apothecia innate or sessile, oblong or linear, rounded, straight or curved mostly simple; disc narrow, uniform, the margins rounded, inflexed; spores elongate-acicular or narrowly fusiform, up to 15-septate, colourless, $40-80\ \mu$ long, $6-7\ \mu$ thick; spermogones with arcuate spermatia $14-16\ \mu$ long, $5\ \mu$ thick. — Carroll in Journ. Bot. vi. 100 (1868); Cromb. Lich. Brit. 100; Leight. Lich. Fl. 387; ed. 3, 410. *O. siderella* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 209, t. 6, f. 14 (1854) (non Ach.?). *O. rubella* Mudd Man. 233, t. 4, f. 90 (1861) (non Pers.?).

Exsicc. Mudd n. 213 (as *O. rubella*).

Distinguished from the preceding by the thinner thallus and the smaller and more slender apothecia.

Hab. On the bark of trees. — *Distr.* Rare in the Channel Islands, England, Wales and Ireland. — *B. M.* Near St. Martin's Church, Jersey; near Penzance, Cornwall; Ullacombe, near Bovey Tracey, Devon; near Stoney Cross, New Forest, Hants; near Glynde, Sussex; Shere, Surrey; Epping Forest, Essex; Dolgelly, Merioneth; Trefriw, Carnarvon; Hoggart's Wood, Ingleby, Cleveland, Yorkshire; Castle Bernard Park, Cork; Tore Mt. and Dinish, Killarney.

Form *taxicola* Cromb. Lich. Brit. 100 (1870). — Differs from the species in the slightly pulverulent thallus and in the more

prominent larger elongate apothecia, which may be simple and scattered or thickly congregate.—Leight. Lich. Fl. 388; ed. 3, 411. *Opegrapha taxicola* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 210, t. 6, f. 15 (1854). *O. rubella* var. *taxicola* Mudd Man. 234 (1861).

Hab. On yew.—*Distr.* Rare in England, Wales and Ireland.—*B. M.* Brockenhurst, New Forest, Hants; Barcombe, near Lewes, Balcombe and Storrington, Sussex; Kingsdown, Kent; near Oxted, Surrey; Twycross, Leicestershire; Llanrychwyn, Carnarvon; Kilarney, Kerry.

26. *O. involuta* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 131 (1858).—Thallus brownish-green, thin, continuous. Apothecia sessile, irregularly elongate or roundish-deformed; disc more or less flattened, the margins thickish and involute; spores 4 to 6 in the ascus, fusiform, colourless, multi-septate.—Carroll in Journ. Bot. iii. 291 (1865); Leight. Lich. Fl. ed. 3, 411. *Graphis involuta* Wallr. Fl. Crypt. Germ. 329 (1831). Specimen not seen.

Closely allied to and perhaps only a growth form of the preceding, from which it differs in the roundish *Lecidea*-like apothecia. Sydow (Flecht. Deutschl. 232, 1887) gives spore sizes as $45-70 \mu \times 5-8 \mu$.

Hab. On bark of holly.—*Distr.* Rare in S. England and S. Ireland.

95. **GRAPHIS** Adans. Fam. Pl. ii. 11 (1763), pro parte; Ach. Lich. Univ. 46 (1810), pro parte; Muell. Arg. in Mém. Soc. Phys. Hist. Nat. Genève xxix. n. 8, 28 (1887). *Aulacographa* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 389 (1854); Mudd Man. 242. (Pl. 29.)

Thallus crustaceous, thin, superficial or developed under the bark (hypophloeodal). Algal cells *Trentepohlia*. Apothecia (*lirellæ*) elongate, rarely roundish, immersed then erumpent, simple or branched; disc narrow and slit-like, rarely somewhat plane; proper margins tumid, prominent, furrowed (*Aulacographa*) or even; hypothecium colourless or dark-coloured; paraphyses vertical, unbranched; asci clavate or elongate, usually 8-spored; spores colourless, elongate, pluriseptate, the cells transversely lentiform.

The genus, as understood by modern lichenologists, includes only species with colourless septate spores. In the British forms the apothecial wall is mostly developed only at the sides (dimidiate); in warmer regions species occur with a well-developed carbonaceous base.

1. *G. elegans* Ach. Syn. Lich. 85 (1814).—Thallus pale cream-coloured or greyish-white, thin, membranaceous, granular or wrinkled. Apothecia linear-elongate, simple, straight or curved; perithecial wall continuous, or with a small opening under the base; proper margins thick, longitudinally furrowed; paraphyses slender, interspersed with small granules; spores cylindrical-

fusiform, with a hyaline epispore, 10–12 septate, 35–55 μ long, 8–11 μ thick (or up to 80 $\mu \times 14 \mu$ *vide* Watson).—S. F. Gray Nat. Arr. i. 503; Cromb. Lich. Brit. 96; Leight. Lich. Fl. 362; ed. 3, 427. *Opegrapha elegans* Borr. in Sm. Engl. Bot. t. 1812 (1807); Hook. in Sm. Engl. Fl. v. 146. *O. sulcata* Moug. & Nestl. ex DC. Fl. Franc. vi. 171 (1815); Tayl. in Mackay Fl. Hib. ii. 107. *Aulacographa elegans* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 389, t. 7, f. 26 (1854); Mudd Man. 242, t. 4, f. 93.

Exsicc. Baxter Stirp. Crypt. n. 21; Bohl. n. 27; Johns. nos. 437, 466; Leight. n. 68; Mudd n. 223; Larb. Lich. Hb. n. 156; Carroll Lich. Hib. n. 13.

Characterized by the furrowed margins of the prominent apothecia, though sometimes the furrows are not well developed. Occasionally the host of *Stenocybe septata* (Part i. 20). The specimen from Ashy, Cumberland, collected by Rev. W. Johnson, was determined as *f. simplicior* by Nylander (Johns. in Cumb. Ass. Adv. Lit. Sci. vi. 155 (1881)). It is evidently only a growth form: the lirellæ are short and prominent, mostly simple but occasionally branched.

Hab. On trees, finest on holly.—*Distr.* General and common in England and Ireland, somewhat rare in Scotland. —*B. M.* Withiel, Cornwall; Ivy Bridge, near Beekley, Beeky Falls, near Exeter, Wistman's Wood and Tavy Valley, Devon; Broomfield, Somerset; Lyndhurst, New Forest, Hants; St. Leonard's Forest, Henfield, Eridge Park, Ardingly and Peas Cottage Gate, near Horsham, Sussex; Bagley Woods, Berks; Charnwood Forest, Leicestershire; Knole Park, Kent; Woodham Walter Common, Epping Forest, Hockley and Hadleigh Woods, Essex; Malvern, Worcestershire; Dolgelly, Merioneth; Crafnant and Church Stretton, Shropshire; Gloddaeth, near Conway, Capel Curig and Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Chatsworth, Derbyshire; Roche Abbey and Baysdale, Cleveland, Yorkshire; Whitbarrow, Kentmere and Staveley, Westmorland; Asby, Cumberland; near Glasgow, Lanarkshire; Ben Lomond, Dumbartonshire; Inverary and near Bonawe, Lorne, Argyll; Glen Tilt, Perthshire; Castle Bernard Park, Bandon, Brown's Demesne, near Riverstown, and Ballyedmond, Cork; Tore Mt., Lough Inchiquin, Dunkerron, Dinish, and Cloghan, Killarney, Kerry; Kylemore, Connemara, Galway.

Form **parallela** Leight. Lich. Fl. ed. 3, 427.—Apothecia narrow, straight, rather long, arranged in a parallel manner.—*Opegrapha elegans* var. *parallela* Schær. Enum. 152 (1850).

Hab. On the bark of cherry and other trees.—*Distr.* Somewhat uncommon in S. and Central England, N. Scotland and Ireland.—*B. M.* Ullacombe, Bovey Tracey, Devon; New Forest, Hants; Wych Cross and High Rocks, Tunbridge Wells, Sussex; Church Stretton, Shropshire; Cader Idris, Merioneth; Trefriw, Carnarvonshire; Glen Tilt, Perthshire; Glengarriff, Cork; Doughruagh Mt., Kylemore, Connemara, Galway; Tullymore Park, Down.

Form **stellata** Leight. l. c.—Apothecia rather short, arranged in radiate stellate groups.

Exsicc. Johns. n. 467.

Hab. On trees.—*Distr.* Rare in S., Central and N. England and S. Ireland.—*B. M.* Ivy Bridge, Devon; New Forest, Hants; Combe St. Nicholas, Somerset; Woodham Walter Common, Essex; Hollybush Hill, Malvern, Worcestershire; Calder Abbey, Cumberland; Torc Mt., Killarney.

Form **coacervata** Leight. *l. c.*—Apothecia aggregate in small scattered groups.

Hab. On trees, especially holly.—*Distr.* Rare in S. and Central England.—*B. M.* Epping Forest, Essex; Holly Park, near Stokesay, Shropshire.

2. **G. petrina** Nyl. in *Flora* lix. 310 (1876).—Thallus greyish-white or scarcely visible. Apothecia few, black, linear, simple; disc narrow, slit-like, the margins tumid, longitudinally furrowed, often white-pruinose; spores elongate, 7–11-septate, brownish, 36–50 μ long, 7–11 μ thick.—Cromb. in *Grevillea* v. 28 & in *Journ. Bot.* xiv. 362 (1876); Leight. *Lich. Fl.* ed. 3, 427.

Scarcely different except in habitat from the preceding species.

Hab. On wet micaceous rocks.—*Distr.* Rare in W. Ireland.—*B. M.* Near Renvyle, Connemara, Galway.

3. **G. ramificans** Nyl. in *Flora* lix. 575 (1876).—Thallus whitish or creamy-white, thin, somewhat wrinkled (K + yellow then orange). Apothecia black, slightly prominent, branched in a dendroid manner; epithecium narrow; proper margins thin, sometimes furrowed, wavy and crisp; apothecial wall colourless at the base (dimidiate); paraphyses slender, conglutinate, swollen and brown at the tips; spores elongate-linear or cylindrical, colourless (becoming pale-reddish?), 10–12-septate, 35–45 μ long, 8–10 μ thick.—Cromb. in *Grevillea* v. 107; Leight. *Lich. Fl.* ed. 3, 433.

Exsicc. Larb. Lich. Hb. without a number.

Closely allied to *G. striatula*, a species from the tropics and Portugal. The apothecia often lie closely parallel to each other, and the margins are occasionally furrowed. The spores in the specimens examined are colourless and measure up to 67 μ long, 12 μ thick.

Hab. On bark of holly.—*B. M.* Homer Wood, Somerset; Lough Inagh and Glendalough, Connemara, Galway (the only localities).

4. **G. scripta** Ach. *Lich. Univ.* 265 (1810).—Thallus thin, membranaceous or subtartareous, greyish-white, cream-coloured or olivaceous, even or wrinkled, effuse or limited by a black line. Apothecia elongate, slender, immersed, then erumpent, the thallus forming an outer white margin, or becoming superficial and prominent, straight or curved, simple or branched; margins narrow, elevated, often wavy and crisp; apothecial wall thick and black, colourless at the base (dimidiate); paraphyses slender, slightly swollen and brown at the tips; spores colourless, some-

times becoming brownish, elongate-cylindrical, 7-10-septate, 20-45 μ long, 7-10 μ thick; spermatogones with minute spermatia 2-5 μ long, 1 μ thick.—S. F. Gray Nat. Arr. i. 502 (excl. syn. Engl. Bot.); Hook. Fl. Scot. ii. 43: Leight. Lich. Fl. 363; ed. 3, 428 (incl. ff. *diffusa*, *varia*, *flexuosa*, and *divaricata*): Mudd Man. 237 (incl. vars. *abietina* (non Schær.), *varia*, *flexuosa*, and *divaricata*): Cromb. Lich. Brit. 96. *G. serpentina* Leight. in Ann. & Mag. Nat. Hist. ser. 2, xiii. 269, t. 6, f. 20 (incl. vars. *diffusa*, *varia*, *flexuosa*, and *divaricata* (non Ach.)). *Lichenoides crusta tenuissima, peregrinis velut litteris inscripta* Dill. Hist. Musc. 125, t. 18, f. 1B (1741). *Lichen scriptus* L. Sp. Plant. 1140 (1753); Lightf. Fl. Scot. 800; With. Arr. ed. 3, iv. 4. *Opegrapha scripta* Ach. Meth. 30 (1803); Grev. Fl. Edin. 353 pro parte; Hook. in Sm. Engl. Fl. v. 147 pro parte; Tayl. in Mackay Fl. Hib. ii. 106 pro parte.

Exsicc. Leight. nos. 18 (f. *flexuosa*), 19 (pro parte), 21 (*G. serpentina* var. *divaricata*); Larb. Lich. Cæsar. n. 88.

A very variable species in the form and appearance of thallus and apothecia. In the typical plant the thallus is developed beneath, or confused with, the outer layers of the cortex and is usually determinate, sometimes limited by a black line, the f. *limitata* of continental lichenologists (*Opegrapha limitata* Pers. in Ust. Ann. vii. 30 (1794)). The apothecia are usually very long and narrow, sometimes almost thread-like (var. *tenerrima* Ach. tom. cit. 266), naked or subpruinose, straight or curved (f. *flexuosa* Leight. *ll. c.*), simple, sparingly scattered over the thallus (f. *diffusa* Leight. *ll. c.*; var. *abietina* Mudd *l. c.*), or branched, crowded and lying in all directions (f. *varia* Leight. *ll. c.*). In f. *divaricata* Leight. *ll. c.* they are rather short, and distinguished by one or more lateral branches growing out at right angles, but this character is confined to very few of the apothecia present on any specimen. The more definitely marked varieties are recorded below. The spores are normally colourless; the brown coloration, as in some other cases, is largely due to arrested growth or to premature decay.

Hab. On bark of various trees.—*Distr.* Common in England and Ireland, less frequently recorded from Scotland.—B. M. Jersey; Withiel, Cornwall; Torquay, Devon; New Forest, Hants; near Handcross, Ardingly, Danny, Midhurst, St. Leonard's Forest, Sussex; Codham Hall and White Colne, Essex; Bath, Somerset; Chepstow, Northamptonshire; Gopsall, Leicestershire; Dolgelly and Barmouth, Merioneth; Gloddaeth, near Conwy, Trefriw and Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Kildale, Airyhoime Wood, Easby Wood and Newton Wood, Cleveland, Hobhole and Ayton, Yorkshire; near Glasgow, Lanarkshire; Aberfeldy, Perthshire; Enniskean, Glenbower, Castle Bernard, Cork; Killarney, Kerry; Glenstale, Tipperary; Doughruagh Mt., Connemara, Galway.

Form recta Nyl. Lich. Scand. 252 (1861).—Thallus in elongated patches, often limited by a black line. Apothecia numerous, arranged in somewhat straight subparallel lines.—Cromb. Lich. Brit. 96; Leight. Lich. Fl. 365; ed. 3, 429; f. *betulina*

Cromb. l. c.; f. *horizontalis* Leight. *tt. cit.* 364 & 428. *Graphis Cerasi* Ach. Lich. Univ. 268 (1810); S. F. Gray Nat. Arr. i. 502. *G. scripta* var. *recta* Mudd Man. 239 (1861); *G. serpentina* var. *recta* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 275 (1854); var. *horizontalis* Leight. *tom. cit.* 271. *Opegrapha recta* Humb. Fl. Friberg. 57 (1793). *O. betulina* Pers. in Ust. Ann. Bot. vii. 31 (1794). *O. Cerasi* Pers. *op. cit.* xi. 20 (1794); Engl. Bot. t. 2301. *O. scripta* var. *recta* Fr. Lich. Eur. 371 (1831).

Exsicc. Leight. n. 244, Mudd n. 217.

Easily recognized by the linear arrangement of the apothecia, which are usually rather long and narrow (f. *recta*) or slightly wider and subpruinose (f. *horizontalis*). In the specimens marked *G. Cerasi* they are mostly rather short and narrow.

Hab. On the bark of various trees.—*Distr.* Somewhat rarer, but coextensive with the species.—*B. M.* Withiel, Cornwall; Newton Bushel and Becky Falls, Devon; New Forest, Hants; Eridge Park and St. Leonard's, Sussex; Shere, Surrey; Epping Forest, Gosfield Woods, and Ulting, Essex; Barmouth, Merioneth; Abdon, Shropshire; Nantybelen, Denbighshire; Baysdale and Bousdale Gill, Cleveland, Yorkshire; Staveley, Westmorland; Beld Craig, Moffat, Dumfriesshire; Falls of Clyde, Lanarkshire; Craigforth, Stirlingshire; near Cork.

Var. *stellata* Mudd Man. 239 (1861).—Thallus similar to the species. Apothecia short, rather plane and often pruinose, arranged in more or less stellate groups, and tapering towards the outer end.—f. *stellata* Leight. Lich. Fl. 365; ed. 3, 429. *Graphis serpentina* var. *stellata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 273 (1854).

Exsicc. Mudd n. 221 (as var. *diffracta*).

Hab.—On the bark of trees.—*Distr.* Somewhat rare in S. and N. England.—*B. M.* New Forest, Hants; near Crawley, Sussex; Gosfield and Messing, Essex; Little Malvern, Worcestershire; Ayton, Airyholme, and Easby Wood, Cleveland, Yorkshire.

Var. *minuta* Mudd l. c.—Thallus similar to the species. Apothecia short, simple, straight or rarely curved, narrow, rather prominent, the margins thickish and uniform; disc usually narrow, sometimes slightly pruinose.—f. *minuta* Leight. Lich. Fl. 363 (1871); ed. 3, 428. *G. serpentina* var. *minuta* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 269 (1854).

Distr. Rare in S. and N. England and S. Ireland.—*B. M.* St. Breock, Cornwall; Becky Falls and Ullacombe, near Bovey Tracey, Devon; near Lyndhurst, New Forest, Hants; Glynde, Sussex; Weald Hall Park, Essex; Cirencester, Gloucestershire; Airyholme Wood, Cleveland, Yorkshire; Brown's Demesne, Riverstown, Cork.

Var. *serpentina* Nyl. Lich. Scand. 252 (1861).—Thallus superficial, thickish, white or greyish, tartareous, pulverulent, determinate, or reduced to a thinnish layer. Apothecia immersed

in the thallus, then more or less erumpent, crowded, curved, simple or variously branched; disc rather narrow, becoming wider, sometimes subpruinose; margins thin, elevated, often crisp and wavy, the thallus usually forming an outer white margin.—Cromb. Lich. Brit. 96; Leight. Lich. Fl. 365 (incl. ff. *cutypa*, *spathea* and *tremulans*); ed. 3, 429 (incl. ff.); vars. *radiata* (non Leight.), *spathea*, *tremulans*, *eutypa* and *diffracta* Mudd Man. 238–240 (1861). *Lichen serpentinus* Ach. Lich. Suec. Prodr. 25 (1798). *Opegrapha serpentina* Schrad. in Schrad. Journ. Bot. 1801, i. 79 (1803); Engl. Bot. t. 1755? *Graphis serpentina* Ach. Lich. Univ. 269 (1810) pro parte (incl. vars. *spathea* and *eutypa*, 270; var. *rugosa*, 271); S. F. Gray Nat. Arr. i. 503; vars. *spathea*, *tremulans* and *eutypa* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 273 & 274 (1854). *G. diffracta* Turn. ex Leight. tom. cit. 276, t. 6, f. 21 (incl. vars.).

Exsicc. Johns. n. 468; Leight. nos. 22, 340; Mudd nos. 218, 219, 220, 222.

Chiefly characterized by the superficial whitish thallus, and almost specifically distinct in the extreme forms. When it is thick and tartareous, with the apothecia deeply immersed it is f. *cutypa*; with a thinner thallus the apothecia become more prominent and have either rather thick straight margins (f. *spathea*) or excessively wavy and tremulous ones (f. *tremulans*). The disc is usually rather narrow, though there are intermediate forms with a wider pruinose disc that connect it with var. *pulverulenta*.

Hab.—On trees.—*Distr.* Fairly common throughout England and S. W. Ireland; rarer in Scotland.—*B. M.* Withiel, Cornwall; near Lustleigh and Torquay, Devon; New Forest, Hants; Hurst, Balcombe and Ardingly, Sussex; Epping Forest, Codham Hall Woods, Hadleigh Woods and Tolleshunt d'Arey, Messing, Essex; Abdon and near Shrewsbury, Shropshire; Malvern, Worcestershire; Yarmouth, Norfolk; Newton Wood, Ayton, Ingleby Park and Airyholme Wood, Cleveland, Yorkshire; Erddig Wood, Denbighshire; Ashgill, Alston, Cumberland; near Glasgow, Lanarkshire; Castle Bernard Park, Rostellan and Ballyedmond, Cork; Tore Mt., Killarney; Killaloe, Clare; Glenstale, Tipperary.

Var. *pulverulenta* Ach. Syn. 82 (1814).—Thallus superficial, whitish, effuse, thinner than in the preceding variety. Apothecia emerging, rather long and curved; margins thickish, elevated; disc becoming plane and pruinose.—Cromb. Lich. Brit. 96; Leight. Lich. Fl. 367 (incl. f. *radiata*); ed. 3, 430. *Opegrapha pulverulenta* Pers. in Ust. Ann. Bot. vii. 29 (1794)? *Graphis pulverulenta* Ach. Lich. Univ. 266 (1810); S. F. Gray Nat. Arr. i. 502? *G. serpentina* var. *radiata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 272 (1854).

Exsicc. Lerb. Lich. Cæsar. n. 87.

Differs from the preceding variety in the thinner thallus and in the expanded pruinose apothecia.

Hab. On trees.—*Distr.* Rare throughout the British Isles.—*B. M.*

Jersey; Tregawn, Withiel, Cornwall; New Forest, Hants; Ullacombe and Lustleigh, Devon; Codham Hall, Hockley Woods, Tolleshunt d'Arcy and Little Waltham, Essex; near Worcester; Capel Curig, Carnarvonshire.

Form *elongata* Malbr. in Bull. Soc. Bot. Fr. xxxi. 98 (1884).—Thallus grey; lirellæ elongate, prominent; spores 40–70 μ long, 8–10 μ thick.—*Graphis elongata* Arn. in Flora lxiii. 568 (1880).

Distinguished by the long lirellæ and by the larger spores.

Hab. On bark.—*B. M.* Near Oxford (collected by Dr. A. H. Church, May, 1924).

96. **PHÆOGRAPHIS** Muell. Arg. in Flora lxxv. 336 (1882). *Hymenodecton* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 279 (1854). *Chiographa* Leight. *tom. cit.* 388. (Pl. 30.)

Thallus crustaceous, thin, superficial or developed under the bark (hypophlæodal). Algal cells *Trentepohlia*. Apothecia (lirellæ) elongate, rarely roundish, immersed then erumpent, simple or branched; disc narrow and slit-like or expanded; proper margins prominent or disappearing; hypothecium colourless or dark-coloured; asci clavate or elongate, usually 8-spored; spores brown, or colourless then brown, elongate, pluriseptate.

Mueller's arrangement of *Graphis* and the allied genera has been followed in order to avoid confusion. Earlier generic names, with undoubted claims to consideration, have been rejected as being too vague or too restricted in definition. The two genera *Hymenodecton* and *Chiographa* were formed by Leighton to mark the difference in the formation of the outer carbonaceous wall of the apothecium: in the former the wall is continuous beneath the base as a thin dark layer; in the latter it is developed only at the sides (dimidiate), and the colourless hypothecium rests on the substratum. More recently Leighton and Crombie included all the species under *Graphis*.

1. **Ph. inusta** Muell. Arg. in Flora lxxv. 383 (1882).—Thallus greyish or whitish-yellow, thin, membranaceous, smooth or wrinkled (K + y, then red). Apothecia black, immersed, usually rather short and broad, obtuse at the ends, simple or branched; proper margins very narrow, with a thin thalloid border; disc plane, naked or pruinose; hypothecium colourless; paraphyses slender, brownish at the slightly clavate tips; spores elongate-linear, becoming dark-brown, 5–7-septate, 28–38 μ long, 9 μ thick.—*Opegrapha scripta* Sm. Engl. Bot. t. 1813 (1807) (non Ach.). *Graphis inusta* Ach. Syn. 85 (1814); Mudd Man. 240 (incl. var. *vera*); Cromb. Lich. Brit. 97; Leight. Lich. Fl. 368; ed. 3, 431 (incl. f. *vera*). *G. Smithii* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 278, t. 6, f. 22 (1854) (incl. var. *vera*).

Exsicc. Larb. Lich. Cæsar. n. 89.

In the typical form described by Acharius (f. *vera* Leight.) the thallus is sometimes surrounded by a dark line; the apothecia are short and stellately arranged in crowded or scattered groups. It is

distinguished from other British members of the genus by the distinctly dimidiate apothecia, the carbonaceous walls being developed at the sides only.

Hab. On the bark of various trees. *Distr.* Rather rare in the Channel Islands, S. and Central England, and S. and W. Ireland, not yet recorded from Scotland.—*B. M.* Beaumont, St. Lawrence, Jersey; Withiel, Cornwall; Chudleigh, Lustleigh and near Lidford, Devon; near Lyndhurst, New Forest, Hants; St. Leonard's Forest, Sussex; Epping Forest, Hockley Woods, Hadleigh Woods, and Gostfield Hall, Essex; Hollybush Hill, Malvern, Worcestershire; Glenbower Wood, Cork; Clonmel, Tipperary; Louisburgh, Mayo.

Form *divaricata* A. L. Sm.—Thallus similar to that of the species. Apothecia more elongate and scattered, occasionally branching at right angles.—*Graphis Smithii* vars. *elongata* and *divaricata* Leight. in Ann. & Mag. tom. cit. 279. *G. inusta* vars. *elongata* and *divaricata* Mudd Man. 240 (1861); ff. *elongata* and *divaricata* Leight. Lich. Fl. 369; ed. 3, 432.

Exsicc. Johns. n. 469.

Differs chiefly in the more elongate apothecia which are often acute at the ends.

Hab. On the bark of various trees.—*Distr.* Rare in S., E. and N. England.—*B. M.* Hurst, Balcombe and Newtimber Downs, Sussex; Gostfield Hall and Codham Hall, Bocking, Essex; Asby, Cumberland.

Var. *macularis* A. L. Sm.—Thallus whitish, usually forming rather large determinate spots on the bark. Apothecia short, rarely furcate, straight or curved, densely scattered over the thallus.—*Graphis Smithii* vars. *macularis* and *simpliciuscula* Leight. in Ann. & Mag. tom. cit. 279. *G. inusta* vars. *macularis* and *simpliciuscula* Mudd Man. 240 (1861); ff. *macularis* and *simpliciuscula* Leight. Lich. Fl. 369; ed. 3, 432.

Exsicc. Larb. Lich. Cæsar. n. 90; Leight. n. 285.

Hab. On the bark of various trees.—*Distr.* More frequent than the species in the same localities and also in Wales.—*B. M.* Rozel, Jersey; Withiel, Cornwall; Torquay and Bovey Tracey, Devon; I. of Wight; New Forest, Hants; St. Leonard's Forest and Glynde, Sussex; Penshurst, Kent; Braydon Forest, Wilts; Epping Forest, Hadleigh Woods, Codham Hall, Messing, and Barking, Essex; Malvern, Worcestershire; near Barmouth, Merioneth; Bettws-y-Coed, Carnarvonshire; Glenmire and near Cork; Killarney, Kerry; Loughcooter, Galway.

2. *Ph. dendritica* Muell. Arg. in Flora lxx. 382 (1882).—Thallus white or greyish, thin or rather thick, more or less wrinkled (K + yellow, then red). Apothecia somewhat variable, long or short, acute at the ends, or almost round, brownish-black, immersed, scattered, curved or straight and sparingly branched towards the centre of the thallus, usually branched and radiating at the circumference; disc rather broad and flat, pruinose, with

thin margins, the thallus forming a white pseudomargin; perithecial wall continuous as a dark line under the base; paraphyses closely confluent, interspersed with small granules, slightly swollen and brown at the tips; spores elongate, colourless, then brown, 7–8-septate, 42–48 μ long, 9–12 μ thick.—*Opegrapha dendritica* Ach. Meth. 31, t. 1, f. 10 (1803); Engl. Bot. t. 1756; Hook. in Sm. Engl. Fl. v. 147; Tayl. in Mackay Fl. Hib. ii. 106. *Graphis dendritica* Ach. Lich. Univ. 271 (1810). S. F. Gray Nat. Arr. i. 503; Mudd Man. 241; Cromb. Lich. Brit. 97; Leight. Lich. Fl. 367; ed. 3, 431 (incl. ff. *Smithii* and *acuta*). *Hymenodecton dendriticum* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 387, t. 7, f. 23 (1854) (incl. vars. *Smithii* & *acuta*).

Exsicc. Larb. Lich. Cæsar. n. 41; Carroll Lich. Hib. n. 11.

Well differentiated by the whitish well-developed thallus and the dendroid branching of the lirellæ. Among the forms distinguished by Leighton, f. *Smithii* is marked by the more deeply-immersed apothecia which branch at an obtuse angle, in this respect differing from f. *acuta* in which the angle is acute. Usually the carbonaceous wall is thinly developed at the base of the apothecium, but in some forms it is thicker, and occasionally there is a gap, observable in section with the microscope, causing the apothecium to appear semidimidiate.

Hab. On trees.—*Distr.* In wooded regions, chiefly in S. England and S. Ireland.—*B. M.* Guernsey; Rozel, Jersey; Hustyn Wood, Bodmin, Cornwall; Carisbrooke, and near Shanklin, I. of Wight; Totnes, Torquay, near Becky Falls, Ivy Bridge and Ullacombe, Devon; Southton Common, Somerset; Stoney Cross, near Bartley Lodge, Brockenhurst, and near Lyndhurst, New Forest, Hants; Minety, Wilts; Ardingly, St. Leonard's, Tunbridge Wells, Tilgate, Danny, Charlton, near Brighton, and Buckhurst Park, Sussex; near Penshurst, Kent; Shere, Surrey; Little Waltham, Pod's Wood, Messing and Epping Forest, Essex; Craigforda, Shropshire; near Malvern, Worcestershire; near Dolgelly, Merioneth; Castle Bernard Park, Bandon, Riverstown and Rostellan, Cork; Killarney, Kerry.

Form *obtusa* A. L. Sm.—Apothecia rounded and obtuse at the ends, frequently furcate or sparingly branched, almost superficial, the thalloidal margin almost disappearing.—*Hymenodecton dendriticum* var. *obtusa* Leight. tom. cit. 388. *Graphis dendritica* f. *obtusa* Leight. Lich. Fl. 368; ed. 3, 431.

A distinctive form owing to the rather crowded and short blunt superficial lirellæ. Leighton notes branching at an obtuse angle as characteristic, but the branches form quite as frequently a right angle with the main apothecium.

Hab. On trees.—*Distr.* Rather rare, but coextensive with the species.—*B. M.* Torquay and near Ilminster, Devon; New Forest, Hants; Kemble, Wilts; Castle Bernard, Cork; Cromaglow, Killarney, Kerry.

3. *Ph. Lyellii* A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 99 (1905).—Thallus thin, membranaceous, smooth, pale-olive or rather dark (K + yellowish or yellow then red). Apothecia

brownish-black, sessile, oblong or linear-oblong, straight or curved, simple or sparingly branched; proper margins thin, the thallus forming a prominent white pulverulent border; disc broad, plane, pruinose; hypothecium dark and carbonaceous; paraphyses interspersed with small granules, slightly swollen and dark at the tips, somewhat conglutinate; spores elongate-linear, 5-7-septate, brownish, becoming dark, 17-34 μ long, 8-10 μ thick.—*Opegrapha Lyellii* Sm. Engl. Bot. t. 1876 (1808); Hook. in Sm. Engl. Fl. v. 147. *Graphis Lyellii* Ach. Syn. 85 (1814); S. F. Gray Nat. Arr. i. 503; Mudd Man. 241; Cromb. Lich. Brit. 97; Leight. Lich. Fl. 369; ed. 3, 432. *Chiographa Lyellii* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 388, t. 7, f. 24 (1854).

Exsicc. Carroll Lich. Hib. n. 12; Cromb. n. 194.

Distinguished from the preceding species by the well-developed carbonaceous base of the apothecia. Several forms have been noted: ff. *radiata*, *macularis* and *fastigiata* by Carroll in Nat. Hist. Rev. vi. 531 (1859) without any definition, and f. *subparallelata* Cromb. ms. in which the lirellæ are unusually long and more or less in parallel lines.

Hab. On trees.—*Distr.* Rare in the Channel Islands, S. England and S. Ireland.—*B.* M. Guernsey; Withiel and near Liskeard, Cornwall; Cury Park, near Lew Trenchard and Harpford, Devon; near Ringwood and near Lyndhurst, New Forest, Hants; Castle Bernard Park, Bandon, Castlemartyr, Brown's Demesne, Riverstown, Carrigaline, and near Crosshaven, Cork.

97. **GRAPHINA** Muell. Arg. in Flora lxiii. 22 (1880).—*Stenographa* Mudd Man. 235. (Pl. 31.)

Thallus crustaceous, thin, superficial or developed under the bark. Algal cells *Trentepohlia*. Apothecia (*lirellæ*) elongate, immersed in the thallus or superficial, simple or branched; disc narrow and slit-like; proper margins tumid, prominent, furrowed or simple; hypothecium colourless or dark-coloured; asci clavate or elongate, usually 8-spored; spores rather large, colourless, muriform.

Distinguished by the muriform colourless spores. As stated already, the earlier *Stenographa* of Mudd, though practically a synonym of *Graphina*, has been rejected in favour of the latter, which is founded on characters recognized as more truly of generic importance, and which occupies a definite position in Mueller's scheme. *Phaeographina* Muell. Arg., with brown muriform spores, is not represented in Great Britain.

1. **Gr. anguina** Muell. Arg. in Flora lxv. 385 (1882).—Thallus effuse or determinate, whitish or pale-yellowish, thin, membranaceous or thickish, tartareous, minutely warted and wrinkled. Apothecia generally crowded, variable in size and direction, simple or branched, straight or curved; disc slit-like, narrow, sometimes slightly dilated and tapering towards the ends; proper margins narrow or tumid, elevated, simple, closely surrounded and often surmounted by the thallus; hypothecium colourless

or pale-brownish, the apothecial wall developed at the sides (dimidiate); paraphyses slender, somewhat conglutinate; epithecium dark-brown; spores large, colourless, muriform, 30–75 μ long, 15–20 μ thick.—*Ustalia anguina* Mont. in Ann. Sci. Nat. sér. 2, xviii. 278 (1842). *Graphis scripta* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 264, t. 6, f. 17 (1854) (non Ach.). *G. anguina* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 395 (1856). *G. sophistica* Nyl. ex Cromb. Lich. Brit. 96 (1870) (non Nyl. in Act. Soc. Sci. Fenn. vii. 465 (1863)); Leight. Lich. Fl. 370; ed. 3, 434 (incl. f. *diffusa*). *Stenographa anguina* Mudd Man. 235 (1861) (incl. vars. *diffusa* and *divaricata*).

Exsicc. Bohl. n. 28 (as *Opegrapha scripta*); Carroll Lich. Hib. n. 10; Johns. n. 470; Mudd n. 216 (as *Stenographa anguina* var. *divaricata*).

The thallus varies from being thin and yellowish to a somewhat thickish light-coloured finely-warted membrane. The apothecia are emergent, more or less prominent and dark-coloured, the disc being narrow and rarely slightly pruinose. The name *sophistica* was given by Nylander to a species of the same genus from New Granada, with somewhat similar spores, but with the margins of the apothecia distinctly furrowed; it does not occur in Great Britain.

Hab. On trees in wooded regions.—*Distr.* Frequent in England, more especially in the Southern Counties and in S. and W. Ireland, rare in Scotland.—*B. M.* Gwiney Moor, Cornwall; Balcombe and St. Leonard's Forest, Sussex; Bath, Somerset; Church Stretton, Shropshire; Gosfield, Hadleigh and Hockley Woods, Essex; Dent, Airyholme Wood and Kildale, Cleveland, Yorkshire; near Corwen, Merioneth; Sedgwick and Levens Park, Westmorland; Calder Abbey, Cumberland; Inishannon and Castle Bernard, Cork; Clonmell, Tipperary; McCarthy's Island, Killarney, Kerry; Doughruagh Mt., Connemara, Galway; Belleclare, Clare Island, Mayo.

Form *radiata* A. L. Sm.—Thallus as in the species. Apothecia rather short, arranged in stellate radiate groups; disc narrow, tapering towards the ends, rarely slightly pruinose.—*Graphis scripta* var. *radiata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 266 (1854). *Stenographa anguina* var. *radiata* Mudd Man. 236 (1861). *Graphis sophistica* f. *radiata* Leight. Lich. Fl. 371 (1871); ed. 3, 434.

Exsicc. Mudd n. 215; Leight. n. 339.

Hab. On trees.—*Distr.* Somewhat rare, but co-extensive with the species.—*B. M.* Gosfield, Chalkeney Woods and Hadleigh Woods, Essex; Gwydir Woods and Gloddaeth, Conway, Carnarvonshire; Hoggart's Wood, Ingleby, Yorkshire; Ballyedmond, Cork; Mallaranny, Achill, Mayo.

Var. *pulverulenta* A. L. Sm.—Thallus thicker and whiter than in the species, tartareous, and generally pulverulent, especially near the apothecia, effuse or in definite roundish patches. Apothecia more deeply immersed, lying in all directions, flexuose,

simple or branched, disc narrow or dilated and often whitish-pruinose, tapering towards the ends.—*Opegrapha pulverulenta* Sm. Engl. Bot. t. 1754 (1807)? (excl. syn.) (non Pers.). *Graphis scripta* vars. *flexuosa* and *divaricata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 265, 266 (1854). *G. pulverulenta* Leight. tom. cit. 268, t. 6, f. 18. *G. sophistica* ff. *flexuosa* and *divaricata*, and var. *pulverulenta* Leight. Lich. Fl. 371 (1871); ed. 3, 434; var. *dendriticoides* Leight. l. c. 435 (1879). *Stenographa anguina* vars. *flexuosa* and *pulverulenta* Mudd Man. 236 (1861).

Exsicc. Johns. n. 471; Leight. n. 18 (as *Graphis scripta* var. *flexuosa*), n. 19 pro parte (as *G. scripta* var. *divaricata*), n. 20 (as *G. pulverulenta*); Larb. Lich. Hb. n. 236.

Differs from the species, more particularly in the character of the thallus, which is often very pulverulent. The apothecia are usually narrow, as in the species, but frequently become dilated and pruinose. Smith's figure of *Opegrapha pulverulenta* in Engl. Bot. closely resembles the outward aspect of the plant, but I have been unable to find a specimen in his herbarium to verify the internal structure.

Hab. On trees in wooded regions.—*Distr.* Somewhat frequent in the S. of England and in S. and W. Ireland, rarer in N. England and Wales, evidently not yet found in Scotland.—*B. M.* Lyndhurst, New Forest, and I. of Wight, Hants; Mithurst, Tilgate, Ardingly and Balcombe, Sussex; Hadleigh and Hockley Woods, Messing, Stansted Mountfitchet and Epping Forest, Essex; Gloddaeth, near Conway and Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Holly Park, near Stokesay, Shropshire; Newton Wood and Ayton, Cleveland, Yorkshire; Whitehaven, Cumberland; Crosshaven, Cork; Castleconnel, Limerick; Killaloe, Clare; Killarney, Kerry; near Clifden, Connemara, Galway; Malaranny, Achill, Mayo.

2. *Gr. inustula* A. L. Sm.—Thallus thin, white, slightly warted and wrinkled, subdeterminate (K + orange-yellow). Apothecia immersed, thinly scattered, short, obtuse, simple or branched; disc broad, plane, whitish-pruinose, proper margins thin, elevated; hypothecium colourless, the apothecial walls lateral only; paraphyses slender, subdiscrete; epithecium blackish-brown; spores muriform, colourless, 35–48 μ long, 12–20 μ thick.—*Graphis inustula* Nyl. in Flora lx. 566 (1877); Cromb. in Grevillea vi. 114; Leight. Lich. Fl. ed. 3, 435.

Exsicc. Larb. Lich. Hb. without a number.

Differs from the preceding species in the flat short pruinose apothecia which somewhat resemble those of *Phaeographis inusta*.

Hab. On holly.—*B. M.* Westport, Mayo.

3. *Gr. Ruiziana* Muell. Arg. in Flora lxiii. 20 (1880).—Thallus greyish-cream-coloured, thin, smooth, determinate or effuse, sometimes limited by a black line. Apothecia black, prominent, sessile or slightly immersed at the base, linear-oblong, rather short, straight or subflexuose; usually simple; disc narrow, sometimes slightly dilated; proper margins tumid, connivent; hypothecium

blackish-brown, the apothecial wall continuous under the base; paraphyses slender, conglomerate; epithecium blackish-brown; spores oblong-ovoid, muriform, colourless, 30–45 μ long, 10–18 μ thick.—*Opegrapha Ruiziana* Fée Ess. Crypt. 27 (1824). *O. anomala* Leight. in Ann. Mag. Nat. Hist. ser. 2, xix. 129, t. 8, figs. 1–6 (1857). *Stenographa anomala* Mudd Man. 236 (1861). *Graphis Ruiziana* Nyl. in Act. Soc. Sci. Fenn. vii. 464 (1863); Carroll in Journ. Bot. iii. 291 (1865); Cromb. Lich. Brit. 96; Leight. Lich. Fl. 370; ed. 3, 433.

Exsicc. Cromb. n. 193.

Hab. On bark.—*Distr.* Not uncommon in S., W. and Central England, Wales, and S. and W. Ireland.—*B. M.* St. Breock, Wadebridge, and near Bodmin, Cornwall; Ivybridge and Ilsham, Torquay, Devon; Lymington, Hants; Malvern, Worcestershire; Dolgelly, Merioneth; Glenbower, Glengariff, and Castlemartyr, Cork; Toro Mt., Cloghan, and Cromaglow, Killarney.

Family VII. CHIODECTONACEÆ.

Thallus crustaceous. Algal cells usually *Trentepohlia*. Apothecia aggregate in specialized prominent stroma-like portions of the thallus (verrucae), deeply immersed, immarginate, small and punctiform or elongate; asci elongate-clavate; spores elongate, pluriseptate.

Characterized by the differentiation of the thallus and by the arrangement and form of the apothecia. The order is well represented in tropical countries; in Great Britain there are only a few species which are contained in the following genera:—

Apothecia immarginate.

Hypothecium colourless or thinly black.

Spores colourless..... 98. *Enterographa*.

Spores brown..... 99. *Sclerophyton*.

Hypothecium thick and black..... 100. *Chiodecton*.

Apothecia marginate..... 101. *Glyphis*.

98. **ENTEROGRAPHÆ** Fée Ess. Crypt. xxxii. (1824). *Stigmatidium* Meyer Entw. Metam. Fortpfl. Flecht. 328 (1825). *Platygramma* Leight. in Ann. Mag. Nat. Hist. ser. 2. xiii. 393 (1854) pro parte (non Meyer). (Pl. 32.)

Thallus crustaceous, thickish, limited by a black hypothallus. Algal cells *Trentepohlia*. Apothecia aggregate or contiguous in lines or solitary, roundish or shortly elongate, immarginate, deeply immersed in the verrucae; hypothecium colourless or thinly black; paraphyses slender, branched; asci clavate, 8-spored; spores elongate-fusiform, colourless, pluriseptate. Spermatogones with cylindrical elongate or elliptical straight or bent spermatia.

The deeply immersed fructifications are occasionally somewhat perithecia-like in form and structure, especially when the disc is

contracted to a small opening. The graphideine character is more apparent in those species that have elongate apothecia.

1. *E. crassa* Fée *op. cit.* xxxii. & xc. t. 1, f. 6 (1824).—Thallus thick, greyish-white, olivaceous or brownish, smooth and polished, becoming somewhat cracked, limited and often intersected by the blackish hypothallus; the verrucæ flat, wide-spreading or prominent. Apothecia brownish-black, minute, numerous, punctiform, solitary or aggregate in flexuose lines, or in small groups, deeply immersed in the thallus, immarginate: hypothecium colourless; spores fusiform-elongate, 5–7-septate, 24–35 μ long, 5 μ thick; spermogones with short rod-like spermatia 4–6 μ long, 1.5–2 μ thick.—*Opegrapha crassa* DC. Fl. Franc. ii. 312 (1805). *Lichen obscurus* Sm. Engl. Bot. t. 1752 (1807) pro parte (non Ach.). *Stigmatidium crassum* Dub. Bot. Gall. ii. 643 (1830); Mudd Man. 243; Cromb. Lich. Brit. 101; Leight. Lich. Fl. 389; ed. 3, 412. *Porina aggregata* Ach. Syn. 112 (1814) *fide* Fries. *Sagedia aggregata* Fr. Lich. Eur. 416 (1831); Leight. Angioc. Lich. 24, t. 8, f. 1. *Pertusaria crassa* Hook. in Sm. Engl. Fl. v. 160 (1833). *Verrucaria obscura* Tayl. in Mackay Fl. Hib. ii. 96 (1836).

Exsicc. Leight. nos. 69, 96 (as *Sagedia aggregata* var. *venosa*); Mudd n. 224; Larb. Lich. Hb. nos. 115, 276 & Lich. Cæsar. n. 45; Bohl. n. 116 (as *Pertusaria crassa*).

Hab. On trunks of somewhat old trees in wooded regions.—*Distr.* Fairly common in the Channel Islands and throughout England, more especially in the southern counties, and in S. and W. Ireland, rare in S. and W. Scotland.—*B. M.* Guernsey; Ann Port, Jersey; Shanklin and near Ryde, I. of Wight; Whitesand Bay and Withiel, Cornwall; Plymouth, near Torquay, and near Totnes, Devon; New Forest and Lymington, Hants; St. Leonard's Forest, Clayton, Woolsonbury, Arundel, and Fairlight, Hastings, Sussex; Coldharbour and Shere, Surrey; Wrotham, Kent; Epping Forest, Gostfield Hall, Hockley Woods, and Rayleigh, Essex; Cirencester, Gloucestershire; Great Glenham, Suffolk; near Norton and near Malvern, Worcestershire; near Shrewsbury, Shropshire; Gloddaeth, near Conway and Llanbedrog, Carnarvonshire; Gopsall and Twycross, Leicestershire; near Nottingham, Westerdale, Cleveland, Yorkshire; Barcaldine, Argyll; Castle Bernard Park, Bandon, Castlemarty, and near Queenstown, Cork; Killarney, Kerry; Glenstale, Tipperary; Dromoland, Clare; Glen Inagh and Derryclare, Connemara, Galway.

Form *saxicola* Cromb. in Herb.—Differs in the somewhat thicker and more distinctly areolate thallus, the hypothallus is also less marked.

Exsicc. Larb. Lich. Hb. n. 115 & Lich. Cæsar. n. 46.

Hab. On rocks.—*Distr.* Rather rare in the Channel Islands, S. England and W. Ireland. —*B. M.* Port Gorey, Sark; Noirmont and La Coupe, Jersey; Whitesand Bay, Cornwall; near Plymouth, Devon; Derryclare, Connemara, Galway.

2. **E. Hutchinsiae** Koerb. Parerg. Lich. 259 (1861).—Thallus crustaceous, rather thin, dull-pale-yellow or brownish, minutely cracked into areolæ, limited by the black hypothallus; the verrucæ small, scattered, flat. Apothecia variable in form, minute, oblong and sometimes round, straight or curved, sometimes branched, plane, immarginate but with a lateral wall which traverses the base as a thin black line; spores fusiform elongate, 5-7- or pluri-septate, 25-30 μ long, 4-5 μ thick.—*Platygramma Hutchinsiae* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 393, t. 7, f. 28 (1854). *Stigmatidium Hutchinsiae* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 132 (1857); Carroll in Nat. Hist. Rev. vi. 531 (1859); Mudd Man. 243; Cromb. Lich. Brit. 101; Leight. Lich. Fl. 390; ed. 3, 413.

Exsicc. Leight n. 130; Mudd nos. 225, 226 (corticolous) Larb. Lich. Hb. n. 116.

Distinguished by the thinner more continuous thallus and by the somewhat prominent apothecia, with spurious thin thalline margins.

Hab. On shaded rocks, rarely on trees.—*Distr.* Rather rare in the Channel Islands, S. and N. England, and S. and W. Ireland, not recorded from Scotland.—*B. M.* St. Peter's Valley, Jersey; near Launceston, near Penzance and Whitesand Bay, Cornwall; near Plymouth, Devon; Edderton Wood, Montgomeryshire; Bettws-y-Coed, Carnarvonshire; Kildale and Newton, Cleveland, Yorkshire; Burton and Levens, Westmorland; Keswick, Cumberland; Dunscombe's Wood, Cork; Muckross Demesne and Dinish Island, Killarney, Kerry; Killary Bay and Derryclare, Connemara, Galway.

3. **E. venosa** Massal. in Verh. K. K. Zool.-Bot. Ges. Wien, x. 679 (1860).—Thallus tartareous, dirty-cream-coloured, smooth, continuous in turgescient patches, limited by a black line; verrucæ thickish, spreading. Apothecia shortly elongate, innate, slender, variously branched and curved, immarginate, internally pale; spores elongate-acicular, up to 13-septate, 38-44 μ long, 3 μ thick.—*Opegrapha venosa* Sm. Engl. Bot. t. 2454 (1812) (non Pers.); Hook. in Sm. Engl. Fl. v. 148. *Platygramma elaborata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. 394, t. 7, f. 27 (1854). *Stigmatidium venosum* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 132 (1857); Mudd Man. 244; Cromb. Lich. Brit. 101; Leight. Lich. Fl. 390; ed. 3, 413.

Characterized by the elongate apothecia and the multiseptate spores.

Hab. On old trees.—*Distr.* Rare in S. England and S. Ireland.—*B. M.* Near Ryde, I. of Wight; New Forest, Hants; Glenstale, Tipperary.

99. **SCLEROPHYTON** Eschw. Syst. Lich. p. 14, f. 8 (1824) *vide* A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 105 (1905). *Stigmatella* Mudd Man. 252 (1861). (Pl. 33.)

Thallus crustaceous. Algal cells *Trentepohlia*. Apothecia roundish or elongate, deeply immersed, thickly grouped, often

confluent; hypothecium clear or colourless; paraphyses slender, branched; asci clavate, 8-spored; spores elongate-clavate or fusiform, brown, pluriseptate.

Well characterized by the brown spores. The spermogones and spermatia are similar to those of *Enterographa*.

S. circumscriptum A. Zahlbr. l. c.—Thallus glaucous-white, thick, tartareous, irregularly cracked, at first limited by a narrow line, becoming subdeterminate or effuse. Apothecia minute, punctiform, crowded into small patches, solitary or confluent in narrow lines, arranged in a dendroid manner towards the circumference; disc plane or slightly convex, naked or pruinose; spores elongate-clavate, dark-brown, 4–7-septate, 20–25 μ long, 5–6 μ thick.—*Verrucaria circumscripta* Tayl. in Mackay Fl. Hib. ii. 96 (1836). *Sagedia circumscripta* Leight. Angioc. Lich. 24, t. 8, fig. 2 (1851). *Stigmatella circumscripta* Mudd Man. 253 (1861). *Stigmatidium circumscriptum* Carroll in Journ. Bot. iii. 291 (1865); Cromb. Lich. Brit. 101; Leight. Lich. Fl. 389; ed. 3, 412; f. *dendrizum* Nyl. in Flora lxiv. 188 (1881); Cromb. in Grevillea x. 23 (1881).

Exsicc. Mudd n. 239; Larb. Lich. Hb. nos. 319, 320.

The fertile verrucæ are not distinguishable from the thick, deeply cracked thallus. The arrangement of the apothecia is very varied; usually they are irregularly scattered, sparse, but very crowded towards the centre of the thallus and arranged in dendroid radiating lines at the circumference (f. *dendrizum*), a character which is fairly constant in well-developed specimens.

Hab. On shaded rocks, not calcareous, usually near the sea.—*Distr.* Not uncommon in the Channel Islands and S. England; rare in N. England and S. and N. Ireland.—*B.* M. Jerbourg, Guernsey; Boulay Bay, Rozel, La Coupe, Belmonte Bay and Noirmont, Jersey; Pentire, St. Minver, Willcoe, Saltash, St. Peter's Point and Banks of the Tamar, Cornwall; Lynmouth and Lidford, Devon; Airyholme Wood, Cleveland, Yorkshire; Killarney, Kerry.

100. **CHIODECTON** Ach. Syn. Lich. 108 (1814). *Syncesia* Tayl. in Mackay Fl. Hib. ii. 103 (1836). (Pl. 34.)

Thallus crustaceous, thin or often rather thick. Algal cells *Trentepohlia*. Apothecia black, immersed in the thalline verrucæ, aggregate or confluent; hypothecium thick, blackish-brown; paraphyses slender, branched; asci clavate; spores elongate-fusiform, 2-pluri-septate, colourless. Spermogones with cylindrical straight or bent spermatia.

Distinguished from other genera of the order by the deep black stromatoid structure of the hypothecium which often connects the apothecia at the base.

1. **C. albidum** Leight. Angioc. Lich. 25, t. 8, f. 4 & t. 9, f. 1 (1851).—Thallus whitish, thin, pulverulent, dotted with white

elevated roundish verrucæ. Apothecia small, immersed in the verrucæ, substellate, or solitary, confluent at the base in a black stroma forming the hypothecium; paraphyses slender, distinct; spores fusiform, colourless, 3-septate, 30–40 μ long, 5–6 μ thick.—Leight. Lich. Fl. 404; ed. 3, 435 (excl. vars.). *C. myrticola* var. *albidum* Mudd Man. 245 (1861); Cromb. Lich. Brit. 105. *Syncesia albida* Tayl. in Mackay Fl. Hib. ii. 103 (1836).

Hab. On shaded rocks.—*Distr.* Rare in S. and N. Ireland.—*B. M.* Dunkerron, and between Kenmare and Killarney, Kerry.

2. *C. petræum* Del. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 418 (1856).—Thallus white, cretaceous, rather thick, and verrucose, smooth. Apothecia immersed in the verrucæ, crowded or confluent, flat and somewhat depressed, whitish-pruinose; paraphyses slender, distinct, spores elongate-fusiform, 3-septate, 30–40 μ long, 5–6 μ thick.—*C. sarniense* Salw. ex Mudd Man. 245 (1861). *C. albidum* var. *sarniense* Mudd l. c.; Leight. Lich. Fl. 404; ed. 3, 435. *C. myrticola* var. *sarniense* Cromb. Lich. Brit. 105 (1870).

Exsicc. Larb. Lich. Hb. n. 356.

Hab. On maritime rocks.—*Distr.* Rare in the Channel Islands and S. England.—*B. M.* I. of Bréhou, Sark; Alderney; Jerbourg, Guernsey; Rozel and Boulay Bay, Jersey; Pentire, St. Minver, Cornwall; Mortehoe, Devon; Penmon, Anglesea.

3. *C. myrticola* Fée Ess. Crypt. i. 63, t. 18, f. 1 (1824).—Thallus effuse, white or yellowish, somewhat granular or mealy, with scattered raised roundish flat verrucæ. Apothecia immersed in the verrucæ, black, small, punctiform, angular or flexuose, often confluent, base confluent, blackish-brown; spores elongate-fusiform, slightly bent, colourless, 2- or 3- (?) septate, 36–48 μ long, 4 μ thick.—Leight. Angioc. Lich. 25, t. 8, f. 3?; Mudd Man. 245; Cromb. Lich. Brit. 105.

Essentially an inhabitant of southern lands (S. France, &c.). The only specimen in the British Museum is imperfectly developed, and it has been impossible to find spores; it agrees externally with the diagnosis given for the species.

Hab. On bark of myrtle and heath.—*B. M.* Killarney, Kerry.

4. *C. subdiscordans* Nyl. in Flora lxii. 221 (1879).—Thallus whitish, thin, granular, continuous, with small roundish verrucæ. Apothecia black, aggregate in the verrucæ; hypothecium blackish; paraphyses not distinct, spores oblong-clavate, 3-septate, 11–16 μ long, 3.5 μ thick, rather thicker upwards; hymenial gelatine bluish, then sordid-yellow with iodine.—Cromb. in Grevillea viii. 29 (1879).

Hab. On moist rocks.—*B. M.* Above Lough Feagh, Connemara, Galway.

101. **GLYPHIS** Ach. Syn. 106 (1816). (Pl. 35.)

Thallus crustaceous. Algal cells *Trentepohlia*. Apothecia immersed in more or less prominent verrucæ, roundish or elongate, simple or branched; apothecial wall well-developed, forming a dark margin; paraphyses simple; asci elongate, 4–8-spored, rather thickened at the tips; spores elongate, pluri-septate, colourless.

Essentially a tropical genus only sparingly represented in Europe. Owing to the elongate apothecia it is perhaps more characteristically graphideine than the other genera of the order. The paraphyses are similar to those of *Graphis*. The spermogones are unknown.

G. labyrinthica Ach. Syn. 107 & in Trans. Linn. Soc. xii. 38, t. 2, f. 1 (1818).—Thallus whitish or brownish-olivaceous, thin, with white rather flat subprominent pulverulent verrucæ. Apothecia small, elongate, forming a reticulation of black lines on the verrucæ; hypothecium brownish, darker downwards; paraphyses slender, crowded, rather indistinct; spores linear-oblong, 3–5-septate, $21\ \mu$ long, $6\text{--}5\ \mu$ thick, becoming slightly brownish.—Leight. in Trans. Linn. Soc. xxvii. 181, t. 36, f. 68 (1870) & Lich. Fl. 403; ed. 3, 436; Cromb. in Journ. Bot. ix. 179 (1871).

Hab. On trees or on wood, very rare.—B. M. Killarney, Kerry.

* SERIES II. PYRENOCARPEÆ.

Thallus foliaceous, squamulose or crustaceous, sometimes developed under the bark (hypophloeodal), or wanting. Algal cells Chlorophyceæ or rarely Cyanophyceæ. Fruiting body a roundish perithecium immersed or superficial, usually opening above by a pore (*ostiole*). Perithecia immersed in the thallus or more or less superficial, scattered or united in a stroma or in a peridium, the outer wall soft and waxy or carbonaceous; contents soft and mucilaginous, often interspersed with oil-drops, sometimes enclosing hymenial gonidia; paraphyses simple or branched, sometimes disappearing or altogether wanting.

The series is marked by the character of the fruits resembling that of the Pyrenomycetes among fungi. The genus *Strigula* is omitted, as the only British species referred to it, *Str. Babingtonii*, is a fungus. The family Astrotheliaceæ is not represented in the British Isles. *Astrothelium parmularia* Leight. Lich. Fl. 467; ed. 3, 499 (*Spharia parmularia* Berk. in Hook. Journ. Bot. iii. 19 (1851)) is a fungus. The genus *Endococcus* is now recognized as consisting of fungi parasitic on the thallus or fruits of various lichens. *Myriangium* (family Myriangiaceæ) is also now regarded as a fungal genus.

The following families are British:—

Thallus squamulose or crustaceous, generally corticated.

Algal cells Cyanophyceæ XXVIII. PYRENIDIACEÆ.

Algal cells Chlorophyceæ XXIX. DERMATOCARPACEÆ.

Thallus variously crustaceous, not corticated. Perithecia simple with apical ostiole.

Algal cells Protococcaceæ ... XXX. VERRUCARIACEÆ.

Algal cells *Trentepohlia* XXXI. PYRENULACEÆ.

Thallus (horizontal) wanting.

Perithecia surrounded by thalline sheath; asci polyspored. Algal cells Protococcaceæ XXXII. THELOCARPACEÆ.

Perithecia united in a stroma. Algal cells

Trentepohlia XXXIII. TRYPTHELIACEÆ.

Perithecia united under a common peridium. Algal cells *Palmella* or *Trentepohlia* XXXIV. MYCOFORACEÆ.

Family XXVIII. PYRENIDIACEÆ.

Thallus squamulose, minutely shrubby or crustaceous. Algal cells (*gonimia*) Cyanophyceæ. Perithecia simple, innate or superficial; spores 4-8 in the ascus, simple or septate, colourless or coloured. *Lophothelium* Stirton has been omitted; it is a fungus parasitic on the thallus of *Stereocaulon condensatum*. See Appendix.

Thallus squamulose; perithecia wanting..... 102. **CORISCIUM**.

Thallus shrubby; perithecia scattered..... 103. **Pyrenidium**.

Thallus wanting; perithecia parasitic 104. **Obryzum**.

102. **CORISCIUM** Wainio Lich. Brésil ii, 188 (1890). (Pl. 36.)

Thallus squamulose, upper surface corticated, lower surface of loose straggling hyphæ. Algal cells *Microcystis* Kütz. (*Polycoccus* Kütz.) occurring in compact, closely crowded groups, which are surrounded and penetrated by the fungal hyphæ. Perithecia and spermogones unknown.

A monotypic genus distinguished from *Normandina* by the nature of the algal cells.

C. viride A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 77 (1903).

—Thallus bright bluish-green, squamulose. The squamules about 2 mm. in diam., lobed and sinuate, somewhat imbricate, closely adhering to the substratum, but rather concave with the margins raised, under surface white, without rhizinae.—*Endocarpon viride* Ach. Lich. Univ. 300 (1810); S. F. Gray Nat. Arr. i. 500; *E. laetevirens* Turn. ex Hook. in Sm. Engl. Fl. v. 158 (1833); Tayl. in Mackay Fl. Hib. ii. 101; Leight. Angioc. Lich. 12. *Verrucaria laetevirens* Borr. in Engl. Bot. Suppl. t. 2658 (1830). *Normandina viridis* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 420 (1856); Mudd Man. 269. *N. laetevirens* Nyl. Lich. Scand. 264 (1861); Cromb. Lich. Brit. 107; Leight. Lich. Fl. 408; ed. 3, 440.

Exsicc. Leight. n. 25; Mudd n. 258.

Hab. On turfy soil, on mosses in bogs, etc.—*Distr.* Somewhat frequent in the Channel Islands and throughout England and Wales,

among the Grampians, Scotland and in Ireland.—*B. M.* Guernsey; Helmen Tor, Cornwall; Ardingly Rocks, Tunbridge Wells and Maresfield, Sussex; Esher, Surrey; Hungershall Rocks, Kent; Oswestry, Shropshire; Barmouth, Arran Penllyn and Cwm Bychan, Merioneth; Aber, Carnedd Dafydd, and Sychnant near Conway, Carnarvonshire; Black Edge near Buxton, Derbyshire; Broughton Bank and Ingleby Moor, Cleveland, Yorkshire; Teesdale, Durham; Ben Ledi and Ben Lawers, Perthshire; Glen Nevis, Inverness-shire; Doneraile Mt., Cork; Mangerton, Kerry; Connemara, Galway.

103. **PYRENIDIUM** Nyl. in Flora xlviii. 210 (1865). (Pl. 37.)

Thallus minute upright (fruticose) rising from a crustaceous base, with a distinct plectenchymatous cortex. Algal cells *Nostoc*. Perithecia, innate opening by a pore; spores oblong-ellipsoid, brownish, septate.

An interesting and unique lichen, being the only example of fruticose growth among the blue-green Pyrenocarpeæ. Crombie has suggested that the fruits may be parasitic fungi; unfortunately the specimens in the British Museum herbarium are sterile. There is no record of any recent collection of the plant. The figures of the fructification on Pl. 37 are taken from Crombie's Monograph.

P. actinellum Nyl. *l. c.*—Thallus adnate and crustaceous at the base, or sward-like with minute upright or semi-prostrate branching fronds which are somewhat nodulose, but generally cylindrical, dark olive-brown in colour; cortex distinct, one cell thick; gonidia in short chains or in groups scattered through the medulla. Perithecia "minute, scarcely prominent, almost entirely innate, the pyrenium entirely black"; spores 4 in the ascus (as figured) "3-septate, brownish, 20-24 μ long, 8-9 μ thick."—Carroll in Journ. Bot. iii. 286 (1865); Cromb. Lich. Brit. 10 & Monogr. i. 81, fig. 21 (1894); Leight. Lich. Fl. 36; ed. 3, 37.

Hab. On cretaceous and calcareous pebbles in moist maritime and upland districts. — Rare in S. and S.W. England. — *B. M.* Anstey's Cove, Torquay, Devon; near Brighton, Sussex; Bexley Hill, Kent; Shere, Surrey.

104. **OBRYZUM** Wallr. Naturg. Flecht. i. 253 (1825) emend.; Nyl. in Flora lv. 353 (1872). (Pl. 38.)

Thallus none. Perithecia minute, globose, parasitic, immersed in the tissue of the host-plant or almost superficial, opening above by a pore; spores 8 in the ascus, fusiform, simple or septate, colourless.

Described at first as homogeneous with the thallus on which the species grow (Collemaeae); its parasitic nature was determined by Nylander (*l. c.*). Vouaux has placed both species of *Obryzum* under the fungus genus *Sphaerulina* (Bull. Soc. Mycol. France xxix. 36, 37, 1913).

1. *O. corniculatum* Nyl. Syn. Lich. i. 136, pl. 2, fig. 10 (1858) & in Flora lviii. 106 (1875).—Thallus none proper. Perithecia immersed or almost superficial on the laciniae of the host thallus, globose; perithecia with entire, thin, brownish wall; paraphyses none; asci small, somewhat elongate, swollen in the middle; spores shortly fusiform, simple, with several guttulæ and pointed at each end, 16–21 μ long, 5–6 μ thick; hymenial gelatine not tinged with iodine.—*Collema corniculatum* Hoffm. Deutsch. Fl. ii. 105 (1795)? *Verrucaria corniculata* Leight. Lich. Fl. ed. 3, 497 (1879).

Hab. Parasitic on various species of *Leptogium*.—*Distr.* Rare in S.W. England.—*B.M.* Weston-super-Mare, Somerset; Cowcombe Wood, Chalford and near Cirencester, Gloucestershire.

2. *O. dolichoteron* Nyl. in Flora lii. 353 (1872).—Thallus none proper. Perithecia projecting like small golden balls from the tissue of the host, scattered, numerous, globose; perithecial wall entire, brownish; paraphyses none; spores narrow, fusiform, colourless, 3–5-septate, 23–27 μ long, 4–5 μ thick.—*Verrucaria dolichotera* Leight. Lich. Fl. ed. 3, 497 (1879).

Differing from the preceding in the lighter coloured perithecia, and in the character of the spores.

Hab. Parasitic on Collemaceæ.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (on *Collema melanum*).

Family XXIX. DERMATOCARPACEÆ.

Thallus spreading, foliaceous or squamulose or subcrustaceous, corticated on one or both surfaces or non-corticated, under surface naked or with rhizinæ. Perithecia simple, more or less immersed in the thallus, opening by a pore at the apex. Spermatogones with short straight spermatia.

The genera of this family occurring in the British Isles are well differentiated by the form of thallus (corticate except in *Normandina*) or spores. *Endocarpion* is further distinguished by the presence of green algal cells (*gonidia*) in the hymenium as well as in the thallus, which are ejected from the perithecium with the mature spores.

Gonidia not present in hymenium.

Spores simple 105. *Dermatocarpion*.

Spores septate 106. *Normandina*.

Spores muriform 107. *Dacampia*.

Gonidia present in hymenium.

Spores muriform 108. *Endocarpion*.

105. **DERMATOCARPON** Eschw. Syst. Lich. 21 (1824) emend.; Th. Fr. Lich. Arct. 252 (1860). (Pl. 39.)

Thallus leafy or squamulose, corticated on both surfaces or only on the upper surface, sometimes with rhizinæ. Algal cells

Protococcaceæ. Perithecia simple, immersed in the thallus, globose or ovate, with a projecting ostiole; paraphyses usually mucilaginous and cohering, or sparingly developed and branched; asci 8-16-spored; spores simple, colourless. Spermatogones divided into hollow chambers, opening by a slit.

The gonidia in this genus are evidently variable. Chodat in his *Monogr. d'Algues en Culture* pure claims to have isolated a *Coccobotrys* nov. gen. from the thallus of *D. miniatum*, but examination of British specimens has shown that in that species, as also in *D. aquaticum* and *D. cinereum*, the alga is a *Protococcus*.

1. *D. miniatum* Th. Fr. *tom. cit.* 253 (1860).—Thallus spreading, ashy-grey or whitish, leafy, peltate, coriaceous, rather large, rounded or somewhat crenate-lobate, smooth or minutely granular-pruinose, attached by a central point to the substratum (umbilicate), the under surface tawny or brownish, smooth or wrinkled. Perithecia minute, numerous, immersed, with a prominent brown ostiole; spores 8 in the ascus, oblong or ellipsoid, 10-16 μ long, 6-9 μ thick. *Lichenoides coriaceum nebulosum cinereum punctatum, subtus fulvum* Dill. Hist. Musc. 223, t. 30, f. 127B. (1741). *Lichen minutus* L. Sp. Pl. 1149 (1758); Huds. Fl. Angl. 454; Lightf. Fl. Scot. ii. 857; With. Arr. ed. 3. iv. 66; Engl. Bot. t. 593, two upper figs. *Endocarpus miniatum* Ach. Meth. 127 (1803); S. F. Gray Nat. Arr. i. 501; Hook. Fl. Scot. ii. 44 & in Sm. Engl. Fl. v. 156 pro parte; Grev. Fl. Edin. 329; Tayl. in Mackay Fl. Hib. ii. 98 pro parte incl. var. *umbilicatum*; Mudd Man. 265; Cromb. Lich. Brit. 107 pro parte; Leight. Lich. Fl. 409; ed. 3, 441. *E. miniatum* var. *umbilicatum* Hook. ex Leight. Angioc. Lich. 11, t. 1, f. 4 (1851).

Exsicc. Dicks. Hort. Sicc. n. 24; Bohl. n. 1; Leight. n. 26; Mudd n. 255; Larb. Lich. Cæsar. n. 94; Cromb. n. 100; Johns. n. 400.

Easily distinguished by central attachment of the thick coriaceous fronds which are up to 5 cm. across or more; they become whitish-pruinose when dry. The algal cells are small and multiply by division (*Protococcus*).

Hab. On dry rocks in maritime or mountainous districts.—*Distr.* Somewhat common throughout the British Isles.—*B.M.* L'Étaq. Beaufort and Rozel Tower, Jersey; Petit-Bot Bay, Guernsey; Tintagel and Pentire, St. Minver, Cornwall; Torquay, Ilsham and near Cockington, Devon; Leigh Wood and Cheddar Cliffs, Somerset; Salisbury Plain, Wilts.; St. Vincent's Rocks, Gloucestershire; Oswestry, Shropshire; Manorbier Castle, Pembrokeshire; Harlech Castle, Merioneth; near Conway, Carnarvonshire; near Beaumaris, Anglesea; Puffin Island; Miller's Dale, Derbyshire; Trowgill, Clapham, Yorkshire; Rokeby, Durham; Egremont, Cumberland; Falls of Clyde, Lanarkshire; Craiglockhart, near Edinburgh; Bowling, Dumbartonshire; near Dunkeld, Kenmore and Glen Lochay, Perthshire; I. of Lismore, Argyll; Craig Guie, Braemar, Aberdeenshire; near Glencorbot and Kylemore, Connemara, Galway; Croaghmore, Clare Island, Mayo.

Var. **leptophyllum** Dalla Torre & Sarnth. Fl. Tirol. 503 (1902).—Thallus small, peltate, solitary or of several lobes, greyish or dark-brown, the under surface dark-coloured.—*Lichen leptophyllus* Ach. Lich. Suec. Prodr. 141 (1798); Engl. Bot. t. 2012, f. 2. *Endocarpion leptophyllum* Ach. Meth. 127 (1803); S. F. Gray Nat. Arr. i. 501; Hook. Fl. Scot. ii. 44 & in Sm. Engl. Fl. v. 157 pro parte; Tayl. in Mackay Fl. Hib. ii. 99; Leight. Angioc. Lich. 12, t. 2, f. 2. *E. miniatum* var. *leptophyllum* Wahlenb. Fl. Suec. 875 (1826); Mudd Man. 266; Cromb. Lich. Brit. 107; Leight. Lich. Fl. 410; ed. 3, 442.

Distinguished from the species by the small size of the thallus (3–10, rarely –23 mm. across). Vainio in his Lich. Fenn. I. 16 (1921) has made this variety a species, *D. meiophyllum*, although he states that it seems to pass into *D. miniatum*.

Hab. On moist rocks.—*Distr.* Rare in subalpine or hilly regions, in N. England, Wales, N. Scotland and S.W. Ireland.—*B.M.* Aberedw, Radnorshire; Bala Lake and Llyn Bodlyn, Merioneth; Cumberland; Loch-na-gat, Ben Lawers, Perthshire; Loch Lomond, Dumbartonshire; Killarney Woods, Kerry.

Var. **complicatum** Th. Fr. l. c. Thallus ascending, composed of numerous densely cæspitose lobes, imbricate and complicate, with the under surface darker than in the species.—Dill. l. c. f. 127A. *Lichen miniatus* var. *complicatus* Lightf. Fl. Scot. ii. 858 (1777) pro parte. *L. complicatus* Swartz in Nov. Act. Upsal. iv. 251 (1784). *L. amphibius* With. Arr. ed. 3, iv. 66 (1796). *L. miniatus* Sm. Engl. Bot. t. 593 lower fig. (1799). *Endocarpion complicatum* Ach. Meth. 128 (1803); S. F. Gray Nat. Arr. i. 501; Hook. Fl. Scot. ii. 44; Grev. Fl. Edin. 329. *E. miniatum* var. *complicatum* Wahlenb. l. c.; Tayl. in Mackay Fl. Hib. ii. 98; Hook. in Sm. Engl. Fl. v. 156; Leight. Angioc. Lich. 11, t. 2, f. 1 & Lich. Fl. 410; ed. 3, 442; Mudd Man. 265; Cromb. Lich. Brit. 107.

Exsicc. Leight. n. 167; Mudd n. 256; Larb. Lich. Hb. n. 158.

Hab. On damp rocks, exposed to spray or occasionally inundated.—*Distr.* Somewhat frequent throughout the British Isles.—*B. M.* L'Etacq, Jersey; Petit-Bot Bay, Guernsey; St. Minver and near Penzance, Cornwall; Dartmoor Tors, Devon; Ebbor Gorge, Somerset; near Cirencester, St. Vincent's Rocks and near Cheltenham, Gloucestershire; Barmouth, Merioneth; near Llanberis, Carnarvonshire; Puffin Island; Cleveland, Yorkshire; Falcon Clints, Teesdale, Durham; Craiglockhart near Edinburgh; Bowling, Dumbarton; Kinnoull Hill, Glen Lochay, Killin, Ben Lawers and Kenmore, Perthshire; I. of Lismore, Argyll; Fort William and Invermoriston, Inverness-shire; Craig Guie, Braemar, Aberdeenshire; Connor Cliffs, Dingle, Killarney, Kerry; Glencorbot and Dawros River, Connemara, Galway.

Form **decipiens** A. L. Sm. Lobes of the thallus ascending, smaller than in var. *complicatum* and more compact, more or less involute and crowded in the centre, spreading at the periphery.—

Endocarpon psoromoides var. *decipiens* Massal. Ric. Lich. 184 (1852).

Hab. On moist rocks.—*Distr.* Rare or infrequent in N. England and N. Scotland.—*B. M.* Teesdale, Durham; south side of Loch Tay, Perthshire.

2. *D. aquaticum* A. Zahlbr. Krypt. Exsicc. n. 652 (1901).—Thallus spreading, polyphyllous, rather thick and coriaceous, the lobes crowded, flaccid, crenate and incurved, tumid, ascending in the centre, more flattened at the circumference, green when wet, pale to brown or dark brown when dry, the under side naked, pale at first then darker coloured. Perithecia minute, innate, sometimes confluent, with slightly prominent brown ostioles: spores 8 in the ascus, oblong or ellipsoid, 10–16 μ long, 6–9 μ thick.—*Lichenoides imbricatum luridum* Dill. Hist. Musc. 224, t. 30, f. 128 (1741). *Lichen aquaticus* Weiss Pl. Crypt. Fl. Goett. 77 (1770); Engl. Bot. t. 594. *L. fluriatilis* Web. Spicil. Fl. Goett. 265, t. 4 (1778); With. Arr. ed. 3, iv. 67. *L. Weberi* Ach. Lich. Suec. Prodr. 142 (1798). *Endocarpon Weberi* Ach. Meth. 128 (1803); S. F. Gray Nat. Arr. i. 501; Hook. Fl. Scot. ii. 45; Grev. Fl. Edin. 329. *E. fluriatile* DC. Fl. Fr. ii. 413 (1805); Mudd Man. 266; Cromb. Lich. Brit. 108; Leight. Lich. Fl. 410; ed. 3, 442. *E. minutum* var. *aquaticum* Schaer. Spicil. 60 (1826); Hook. in Sm. Engl. Fl. v. 156; Tayl. in Mackay Fl. Hib. ii. 98.

Exsicc. Johns. n. 435; Larb. Lich. Hb. n. 358 & Lich. Cæsar. n. 95.

Approaches var. *complicatum* of the preceding species in the size and form of the thalline lobes, but is well distinguished by its thicker coriaceous character and by the habitat. The lobes, usually rather large and rounded up to 2.5 cm., are occasionally only from 1 to 0.5 cm. in width and deeply cut and lacinate. A very light-coloured form has been named by Crombie (ms.) as f. *pallescens*.

Hab. On rocks and stones in streams and lakes.—*Distr.* Rare, but widely distributed, chiefly in upland districts. *B. M.* East coast of Jersey; Saints Bay, Guernsey; St. Breock, Cornwall; River Teign, near Kestor, Lydford, the Dart River and Ivy Bridge, Devon; Tewy Llandyssil, Cardiganshire; Harlech Castle and Barmouth, Merioneth; Ilam, Staffordshire; Pistyll Rhaiadr, Denbighshire; Llyn-y-Fan-fach, Carnarvonshire; Anglesea; Windermere, Westmorland; Derwent Water and Ennerdale Lake-side, Cumberland; Egglestone and Teesdale, Durham; Kincairdineshire; Loch Lomond, Dumbartonshire; Appin, Argyll; Loch Dochart, Loch Tummel and shores of Loch Tay, Killin, Perthshire; shores of Loch Linnhe, Inverness-shire; Killarney, Kerry; Corraun Lake and Achill Isl., Mayo.

Var. *euplocum* A. L. Sm.—Thallus coriaceous, minute, monophyllous, affixed to the substratum by a central point, deeply lobed, the margins crisped and recurved, olive-green when moist, greyish or brownish when dry.—*Lichen euplocus* Ach. Lich. Suec. Prodr. 141 (1798). *Endocarpon euplocum* Ach. Meth. 127, t. 3,

f. 4 (1803); Borr. in Engl. Bot. Suppl. t. 2602, f. 2; Hook. in Sm. Engl. Fl. v. 157; Leight. Angioc. Lich. 12, t. 2, f. 3. *E. fluviale* var. *euplocum* Mudd Man. 266 (1861); Leight. Lich. Fl. 411; ed. 3, 443. *E. miniatum* var. *euplocum* Wahlenb. Fl. Suec. 875 (1826); Cromb. Lich. Brit. 107. *Verrucaria euploca* Borr. in Engl. Bot. Suppl. l. c. text (1831).

A minute variety of the species bearing the same relation to it as var. *leptophyllum* does to *D. miniatum*.

Hab. On moist rocks, maritime or inland.—*Distr.* Rare in N.E. England.—*B.M.* Eglwyseg Rocks, Llangollen and Berwyn, Denbigh; on the shore of the Tyne, near Newcastle, Northumberland.

3. *D. lachneum* A. L. Sm.—Thallus coriaceous, squamose, brownish-red, the squamules roundish, flexuose or incised, often imbricate with the margins free, or appressed and adnate, under surface rhizinose. Perithecia minute, the ostioles dark-brown; spores 8 in the ascus, oblong or ovate, 13–18 μ long, 8 μ thick.—*Lichen lachneus* Ach. Lich. Suec. Prodr. 140 (1798); Sm. Engl. Bot. t. 1698 (1807). *L. leptophyllus* Sm. Engl. Bot. t. 2012, f. 1 (1809). *Endocarpon lachneum* Ach. Meth. 127 (1803); S. F. Gray Nat. Arr. i. 500; Tayl. in Mackay Fl. Hib. ii. 99; Leight. Angioc. Lich. 14, t. 3, f. 2 pro parte. *E. rufescens* Ach. Lich. Univ. 304 (1810); Mudd Man. 267 pro parte; Cromb. Lich. Brit. 108; Leight. Lich. Fl. 411; ed. 3, 443 (incl. f. *lachneum*). *E. Hedwigii* var. *lachneum* Hook. in Sm. Engl. Fl. v. 156 (1833).

Essicc. Bohl. n. 75 (as *Endocarpon Hedwigii*); Johns. n. 436.

The species name *lachneum* is older than *rufescens*, and Smith's figure of *Lichen lachneus* unquestionably represents this plant. Acharius originally described *E. rufescens* as reddish when fresh, and *E. lachneum* as at first greenish-brown. The British specimens vary in colour from brown to brownish-red when dry; but when moist the thallus may be green.

Hab. On earth among rocks, chiefly in upland regions.—*Distr.* Rare in the maritime and hilly regions of the British Isles.—*B. M.* St. Minver, Cornwall; Torquay, Devon; Albourne and near Houghton, Sussex; Shipham, Cheddar Cliffs, Clifton and Bathampton Downs, Somerset; Llanymynech Hill, Shropshire; Malvern Hill, Worcestershire; Tenby, Pembrokeshire; Newmarket Heath, Cambridgeshire; near Buxton and Dovedale, Derbyshire; Malham and Ingleton, Yorkshire; Windermere, Westmorland; King's Park, Edinburgh; near Loch Lomond, Dumbartonshire; Craig Calliach and Ben Lawers, Perthshire; Craig Guie, Braemar, Aberdeenshire; Hills of Applex, Ross-shire; west of Westport, Mayo.

4. *D. hepaticum* Th. Fr. Lich. Arct. 255 (1860).—Thallus coriaceous, squamulose, brownish to dark-brown, the squamules round or angular, closely adnate, more or less dispersed, the margins entire, sometimes rather raised and blackish, the under surface fibrillose. Perithecia minute, the ostioles dark-brown; spores 8 in the ascus, oblong, 11–16 μ long, 6–8 μ thick.—

Lichenoides, quod *Lichen pulmonarius terrestris*, etc. Dill. Hist. Musc. 228, t. 30, f. 133 (1741)? *Lichen trapeziformis* Zoega ex Dicks. Pl. Crypt. ii. 22 (1790)? Engl. Bot. t. 595? *L. Hedwigii* Ach. Lich. Succ. Prodr. 140 (1798). *Endocarpum hepaticum* Ach. Lich. Univ. 298 (1810); (Cromb. Lich. Brit. 108 pro parte; Leight. Lich. Fl. 412; ed. 3, 443 (incl. f. *exiguum*). *E. Hedwigii* S. F. Gray Nat. Arr. i. 500 (1821) pro parte; Grev. Fl. Edin. 329 pro parte; Hook. in Sm. Engl. Fl. v. 156 (1833)? (non Ach.); Leight. Angioc. Lich. 14, t. 3, f. 3 (1851) pro parte. *E. pusillum* Tayl. in Mackay Fl. Hib. ii. 99 (1836) (non Hedw.); Mudd Man. 268 (1861) pro parte. *E. exiguum* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 422 (1856).

Exsicc. Leight. n. 135 (as *Endocarpum Hedwigii*); Mudd n. 257 (as *E. pusillum*).

Closely allied to the preceding species, but the colour of the thallus is usually brown, though also sometimes said to be greenish when fresh, the squamules smaller, more scattered, more closely adnate and often with a dark edge, the spores also are rather smaller. It has been confused with *Endocarpum pusillum*, which has a somewhat similar thalline development. It is impossible in the absence of specimens to identify accurately the plants included under *Lichen trapeziformis* by Dickson and Smith.

Hab. On the ground in barren places and on old walls.—*Distr.* Rare throughout the British Isles.—*B. M.* Noirmont, Jersey; St. Minver and near Penzance, Cornwall; Babbacombe and Totnes Downs, Devon; Newhaven Cliffs, near Lewes, and Box Grove near Chichester, Sussex; Reigate Hill, Surrey; Epping Forest, Essex; Fairford and Cirencester, Gloucestershire; Moor Park, Herefordshire; Tenby, Pembrokeshire; near Dolgelly, Merioneth; I. of Anglesea; Clapham, Yorkshire; Appin, Argyll; Ben Lawers and Glen Lochay, Killin, Perthshire; Lower Road, Cork; Dunkerron, Kerry; Belclare, Mayo.

5. *D. cinereum* Th. Fr. Lich. Aret. 256 (1860).—Thallus squamulose, closely adherent, greyish or brown, the squamules scattered or congregate, the under surface black. Perithecia numerous, minute, with a prominent dilated dark-brown ostiole; spores 8 in the ascus, elliptical-oblong, rather large, simple or sometimes pseudo-septate, colourless, 18–22 μ long, 8–11 μ thick.—*Endocarpum cinereum* Pers. in Ust. Ann. Bot. vii. 28 (1794); Mudd Man. 268. *E. tephroides* Ach. Meth. 129 (1803); S. F. Gray Nat. Arr. i. 499 (1821); Hook. Fl. Scot. 44 pro parte & in Sm. Engl. Fl. v. 159. *Lichen tephroides* Ach. Lich. Succ. Prodr. 18 (1798); Engl. Bot. t. 2013. *Sagedia cinerea* Fr. Lich. Eur. 413 (1831); Leight. Angioc. Lich. 22, t. 7, f. 1. *Verrucaria tephroides* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 17 (1858); (Cromb. Lich. Brit. 108; Leight. Lich. Fl. 428; ed. 3, 458).

Exsicc. Larb. Lich. Cæsar. n. 96 & Lich. Hb. n. 117.

The spores are for a long time simple and full of small granules, but at maturity they seem to be more or less faintly septate, and have been so figured by Leighton.

Hab. On the ground mostly in mountainous regions.—*Distr.* Rare in the Channel Islands, S. and N. England, N. Scotland and W. Ireland.—*B. M.* Grosnez Common, Jersey; Cader Idris, Merioneth; Teesdale, Durham; Craig Calliach, Finlarig, Killin and Ben Lawers, Perthshire; Ben Cruachan and I. of Lismore, Argyll; Hills of Applex, Ross-shire; Craig Guie, Braemar, Aberdeenshire; Stronsay, Orkney; Cleggan, Connemara, Galway.

Var. *cartilagineum* A. L. Sm.—Squamules firmer, more cartilaginous than in the species, subimbricate and sublobate, pale-greyish or brownish.—*Verrucaria tephroides* var. *cartilaginea* Nyl. in *tom. cit.* 18; Cromb. Lich. Brit. 109; Leight. Lich. Fl. 428; ed. 3, 459. *V. cartilaginea* Carroll in Journ. Bot. iv. 24 (1866).

Hab. On the earth.—*Distr.* Rare in Alpine localities.—*B. M.* Summit of Ben Lawers, and summit of Craig Calliach, Perthshire; Assynt, Sutherland (on Durness limestone rocks).

6. *D. macrocarpon* A. L. Sm.—Thallus of small squamules, scattered or aggregate, sublobate or subcrenate, appressed, pale-dusky-olive when dry, light-green when wet. Perithecia immersed in the squamules, the upper part free, opening by a pore; perithecial wall thick: spores 8 in the ascus, ellipsoid, colourless, very large, 40–45 μ long, 15 μ thick.—*Endocarpon macrocarpon* Tayl. in Mackay Fl. Hib. ii. 258 (1836); Leight. Angioc. Lich. 15, t. 14, f. 2 (1851)? *Verrucaria macrocarpa* Mudd Man. 290 (1861).

Leighton's figure represents a globose fruit with a double wall, the inner enclosing the hymenium, and between it and the base "a dirty-white or tartareous mass." The spores according to the same figure are simple, brownish-coloured and ellipsoid, about 25 μ long, 12 μ thick. These characters do not correspond with those given above of the original specimen from Taylor in the British Museum. The plant in the single specimen seen is associated with *Pannularia nigra*. Possibly identical with *Verrucaria macrostoma* (p. 310).

Hab. On slaty rocks.—*Distr.* Very rare in S.W. Ireland.—*B. M.* Dunkerron, Kerry (the only locality).

106. **NORMANDINA** Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. 191 (1855) emend.; Wainio Lich. Brésil ii. 188 (1890). (Pl. 40.)

Thallus foliaceous or squamulose, the squamules raised or appressed, without a cortical layer. Algal cells Protococcaceæ. Perithecia immersed, globose or ovate with a blackish wall; paraphyses wanting; spores 8 in the ascus, elongate-cylindrical, septate, colourless, becoming brownish.

A monotypic genus very widely spread in Europe, America and New Zealand, though not common. It differs from *Coriscium* in the algal constituent.

N. pulchella Cromb. Lich. Brit. 107 (1870).—Thallus glaucous or greenish-grey, squamulose, the squamules round or

rounded-lobate, dainty and small, adnate, often concentrically wrinkled, the margins raised, thickened or inflexed and frequently sorediate, pale-brownish and tomentose beneath. Perithecia very rare, immersed in the thallus, the black ostiole protruding; spores linear-cylindrical, 6-7-septate, colourless, becoming brownish, 28-40 μ long, 6-10 μ thick: hymenial gelatine wine-red with iodine.—Leight. Lich. Fl. 408; ed. 3, 440. *Verrucaria pulchella* Borr. in Engl. Bot. Suppl. t. 2602, f. 1 (1829) (text). *Endocarpon pulchellum* Borr. in Engl. Bot. Suppl. t. 2602, f. 1 (1829) (plate); Hook. in Sm. Engl. Fl. v. 158; Tayl. in Mackay Fl. Hib. ii. 101; Leight. Angioc. Lich. 13, t. 3, f. 1. *Normandina Jungermanniae* Nyl. l. c.; Mudd Man. 268.

Ersicc. Cromb. n. 197; Johns. n. 399; Larb. Lich. Hb. 157 & Lich. Cæsar. n. 93; Leight. n. 367.

Easily recognised by the dainty shell-like squamules, which form a striking contrast to the darker mosses over which they spread.

Hab. On mossy trees.—*Distr.* Not common, but occurring in all parts of the British Isles.—*B. M.* St. Peter's Valley, Rozel, Jersey; Guernsey; near Launceston, and Withiel, near Bodmin, Cornwall; Plymouth, near Lidford, Ullacombe near Bovey Tracey, and near Ilfracombe, Devon; near Ryde, I. of Wight; New Forest, Hants; Ingatestone, Essex; St. Leonard's Forest, Poyning's Common, Saddlescomb, Arundel Park, Glynde, Ardingly, Wiston, Crowborough and Beeding Priory, Sussex; Sapperton, Gloucestershire; Dolgelly and Barmouth, Merioneth; Keswick, Cumberland; The Trossachs, Ben Ledi, Glen Lochay, Glen Falloch and Finlarig, Killin, Perthshire; Barcaldine, Argyll; Glen Nevis, Inverness-shire; Derriquin, Killarney, Kerry; Letterfrack, Connemara, Galway; Louisburgh, Mayo.

107. **DACAMPIA** Massal. Sulla *Lecidea Hookeri* di Schærer, Verona, 1853, 7. (Pl. 41.)

Thallus squamulose, spreading, with a black subiculum. Algal cells Protococcaceæ. Perithecia entire, carbonaceous; paraphyses persistent, branched; asci elongate; spores ellipsoid-fusiform, variously septate and muriform, brown.

A somewhat doubtful monotypic genus; the perithecia have been regarded by A. Zahlbruckner (Pflanzenf. i. 1*, 78 (1908)) and other lichenologists as a fungus parasitic on a lichen-thallus. It is referred to by Leighton Lich. Fl. 309; ed. 3, 323, as a minute *Spharia Hookeri* Nyl.

D. Hookeri Massal. l. c. t. 1, fig. 4.—Thallus squamulose, whitish, thick, somewhat lobate at the circumference, appressed and farinose, not corticated. Perithecia rising from the lower dark stratum, obpyriform with a somewhat wide ostiole; perithecial wall dark-brown, rather thick, entire; paraphyses stoutish, branched and entangled, conglutinate or free; asci elongate; spores 8 in the ascus, ellipsoid, fusiform, 3-5-septate, rarely only 2-celled, constricted in the middle, becoming muriform, dark-brown, the end cells small, lighter in colour, 20-35 μ long, 10-12 μ

thick.—*Verrucaria Hookeri* Borr. in Engl. Bot. Suppl. t. 2622, fig. 2 (1830); Hook. in Sm. Engl. Fl. v. 155; Leight. Angioc. Lich. 64, 77, t. 27, fig. 5. *Lecidea Hookeri* Schær. Enum. 102 (1850); Cromb. Lich. Brit. 88; Leight. Lich. Fl. 309; ed. 3, 322.

Exsicc. Leight. n. 318.

Considerable confusion of views has arisen as to the structure and systematic position of Borrer's plant, the perithecia having more recently been described as fungi parasitic on the thallus of *Lecidea Hookeri*, the latter having 2-celled brown spores. There is no record of *L. Hookeri* in Britain other than the specimens bearing the perithecia of *Dacampia*, and in that respect the continental specimens examined agree with the British. The 2-celled brown spores are occasionally present along with the more developed muriform ones. The thallus becomes dark-brown in the lower parts, passing into brown fungal hyphæ (the hypothallus of the lichen), and from this lower stratum the perithecia are developed; they are true perithecia when first formed, but tend to widen out or collapse above to an almost lecideine form as described by Schærer. Further investigation and more accurate observations of fresh material are necessary to determine the existence of two plants, and the fungal or symbiotic character of the perithecium.

Hab. On earth on alpine rocks.—*B. M.* Plentiful on the summit of Ben Lawers.

108. **ENDOCARPON** Hedw. Descr. Adumbr. Musc. frond. ii. 56 (1788); emend. Th. Fr. Lich. Arct. 257 (1860); A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 61 (1903). (Pl. 42.)

Thallus squamulose, or almost crustaceous, corticated on both surfaces or only on the upper surface, sometimes rhizinose beneath. Algal cells Protococcaceæ. Perithecia simple, immersed in the thallus, globose or ovate, with a more or less prominent ostiole and with hymenial gonidia; paraphyses mucilaginous, disappearing; asci 1–6-, usually 2-spored; spores elongate-ellipsoid, muriform, at first colourless, becoming dark-brown.

First published as a genus by Hedwig with *E. pusillum* as the type; it was finally emended by A. Zahlbruckner to include only those forms that have a squamulose thallus with muriform spores and hymenial gonidia; these green algal cells are produced in loose filaments or masses alongside of the asci and paraphyses, and are ejected from the perithecium with the mature spores.

Endocarpon rugosum Tayl. in Mackay Fl. Hib. ii. 258 (1856) is indeterminable. Leighton Angioc. Lich. 15, pointed out its resemblance to *Pertusaria* rather than to *Endocarpon*.

1. **E. pusillum** Hedw. l. c. t. 20A, figs. 1–8.—Thallus squamulose, greyish- or reddish-brown, the squamules scattered or crowded, small, closely adnate to the substratum, the margins slightly raised and crenate. Perithecia minute, black, with a prominent black ostiole; hymenial gonidia small, in lines parallel with the asci or in masses; spores 2 in the ascus, oblong, becoming brown, slightly constricted in the middle, muriform, and multi-

cellular, 45-55 μ long, 14-19 μ thick.—*Lichen trapeziformis* Zoega ex Dicks. Pl. Crypt. ii. 22 (1790)? *L. endocarpon* With. Arr. ed. 3, iv. 52 (1796)? *Verrucaria Garovaglii* Mont. in Ann. Sci. Nat. sér. 3, xi. 59 (1849); Cromb. Lich. Brit. 109 pro parte; Leight. Lich. Fl. 459; ed. 3, 491 pro parte. *Dermatocarpon Garovaglii* Mudd Man. 270, t. 5, f. 111 (1861) pro parte.

Hab. On earth-covered rocks.—*Distr.* Rare in S. England.—*B. M.* Alum Bay, I. of Wight; cliffs, Rottingdean, Sussex; Thetford, Norfolk.

2. *E. sorediatum* Hook. in Sm. Engl. Fl. v. 158 (1833); A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 61 (1903).—Thallus squamulose, olive-green, brown when dry, the squamules mostly scattered, appressed, irregularly lobed, the margins slightly elevated and crenate, under surface pale-grey. Perithecia minute, black, the ostiole powdery, blackish-grey; spores as in the preceding species.—Leight. Angioc. Lich. 18. *Verrucaria sorediata* Borr. in Engl. Bot. Suppl. t. 2612, f. 2 (1829).

Often included in the preceding species, from which it differs only in the larger size and lighter colour of the thallus, and in the powdery apex of the perithecia.

Hab. On mud walls.—*Distr.* Very rare, recorded only from Thetford, Norfolk.—*B. M.* One small specimen without locality.

3. *E. pallidum* Ach. Lich. Univ. 301 (1810).—Thallus pale-reddish-brown, squamulose, the squamules minute, crowded, imbricate, lobate and crenate. Perithecia minute, dark-brown, the ostioles prominent, brownish-black; spores 2 in the ascus, brownish, linear-oblong, muriform becoming brown, large, 34-54 μ long, 14-19 μ thick, sometimes slightly constricted.—S. F. Gray Nat. Arr. i. 500; Hook. in Sm. Engl. Fl. v. 157; Tayl. in Mackay Fl. Hib. ii. 99; Leight. Angioc. Lich. 19, t. 5, f. 3. *Lichen pallidus* Sm. Engl. Bot. t. 2541 (1813). *Verrucaria pallida* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 424 (1856); Cromb. Lich. Brit. 109; Leight. Lich. Fl. 459; ed. 3, 491. *Dermatocarpon pallidum* Mudd Man. 269 (1861).

Well distinguished by the small imbricate crowded squamules.

Hab. On earth-covered rocks.—*Distr.* Rare in S.W. Ireland.—*B.M.* Killarney, Kerry.

Family XXX. VERRUCARIACEÆ.

Thallus crustaceous, superficial or developed within the substratum, not corticated. Algal cells (*gonidia*) Protococcaeæ or *Palmella*, sometimes present in the hymenium. Perithecia simple, globose or semi-globose, more or less immersed, opening by a pore at the apex (*ostiole*); asci 2-8-spored; paraphyses persistent or disappearing in mucilage. Spermatogones globose, immersed, with septate sterigmata and oblong or ellipsoid spermatia.

The family is distinguished by the crustaceous thallus, bright-green gonidia and simple fruits. There are eight British genera :—

Gonidia not present in hymenium.

Paraphyses disappearing.

- | | |
|-------------------------------|---------------------------|
| Spores simple, ellipsoid..... | 109. Verrucaria. |
| Spores simple, vermiform..... | 110. Sarcopyrenia. |
| Spores 1-3 septate..... | 111. Thelidium. |
| Spores muriform | 112. Polyblastia. |

Paraphyses persistent.

- | | |
|---------------------------|-------------------------|
| Spores simple..... | 113. Thrombium. |
| Spores multi-septate..... | 114. Gongylia. |
| Spores muriform | 115. Microglæna. |

Gonidia present in hymenium

- | | |
|-----------------------|--------------------------|
| Spores muriform | 116. Staurothele. |
|-----------------------|--------------------------|

109. **VERRUCARIA** Wigg. Prim. Fl. Holsat. 85 (1780); Pers. in Ust. Ann. Bot. vii. 23 (1794) pro parte; emend. Th. Fr. Lich. Aret. 267 (1860).—*Lithocia* S. F. Gray Nat. Arr. i. 497 (1821) pro parte. (Pl. 43.)

Thallus crustaceous, continuous, areolate or pulverulent, sometimes developed within the substratum. Algal cells Protococcaceæ or *Palmella*. Perithecia immersed in the thallus or superficial, the outer wall of a carbonaceous or horny structure completely surrounding the perithecium (*entire*) or developed only over the upper part (*dimidiate*), opening above by a pore or slit (*ostiole*); paraphyses soon becoming mucilaginous and disappearing; filaments within the ostiole (*periphyses*) usually well developed; asci 8-spored; spores ellipsoid or subglobose, simple, very variable in size, colourless, rarely brown.

The *Verrucaria* of early authors was based on characters that belong to widely different Lichens. Persoon first defined the genus as possessing subglobose fruits; Th. Fries restricted it to those species with simple usually colourless spores and with paraphyses more or less dissolved in mucilage. In some species the dark outer perithecial wall is strongly developed only over the upper half of the fruits and spreads out at the base, a colourless or brownish layer of cells called the inner wall or tunic being continued under the base; this character is considered by some lichenologists to have generic value—*Lithocia* S. F. Gray, *Lithoidea* Massal. Mem. Lich. 141 (1853).

Chodat has recorded (*Monogr. d'Algues en Culture pure*, 1913, 217, etc.) the isolation of a colonial alga with rather small cells from *Verrucaria nigrescens* which he names *Coccobotrys Verrucarise* gen. et sp. nov.

Maritime species growing within reach of waves or spray from the sea; thallus more or less gelatinous when moist.

1. **V. maura** Wahlenb. ex Ach. Meth. Suppl. 19 (1803).—Thallus black or dark-reddish- or brownish-black, thickish, or thin, smooth or subgelatinous, shining or occasionally minutely scabrid, cracked into minute areolæ. Perithecia moderate in size, hemispherical, scattered, immersed in the thallus, the ostiole

more or less visible; perithecial wall dimidiate and spreading at the base, a thin black layer being continued under the base; spores ellipsoid, 12-17 μ long, 7-8 μ thick, sometimes rather larger; hymenial gelatine wine-red with iodine.—Hook. Fl. Scot. ii. 43 & in Sm. Engl. Fl. v. 154; Grev. Fl. Edin. 353; Tayl. in Mackay Fl. Hib. ii. 93; Leight. Angioc. Lich. 59, t. 25, f. 3 & Lich. Fl. 419; ed. 3, 449; Mudd Man. 284; Cromb. Lich. Brit. 113. *V. aractina* Wahlenb. *tom. cit.* 17; Cromb. *l. c.* (*fide* Leighton Lich. Fl. 419). *V. aspera* Tayl. in Hook. Lond. Journ. Bot. vi. 153 (1847)? *Lichen maurus* Sm. Engl. Bot. t. 2456 (1812). *Lithocia maura* S. F. Gray Nat. Arr. i. 498 (1821).

Exsicc. Leight. n. 33 *pro parte*.

Easily distinguished by the maritime habitat and by the well-developed generally smoothish cracked thallus; the minute areole are slightly raised at the margin. The more scabrid form has been described as var. *aractina* Th. Fr. Lich. Arct. 268 (1860). It was collected by M. C. Knowles at Howth "in sunny situations and at higher levels than the species" (Sci. Proc. Roy. Dubl. Soc. xiv. 136 (1913)).

Hab. On maritime rocks, mostly above tide-level.—*Distr.* Somewhat common on all coasts of the British Isles.—*B. M.* Sark; Gerrans, Cornwall; Torquay, Devon; Shoreham, Sussex; Manorbeer near Tenby, Pembrokeshire; Harlech Castle, Merioneth; Pwllheli, Geganwy and Conway Bay, Carnarvonshire; Garwick, I. of Man; Arnside, Westmorland; near Dunbar, Haddingtonshire; Fifeshire; Wills' Braes, Forfarshire; Portlethen, Kincardineshire; Dunkerron and Kenmare River, Kerry; Achill Isl. and Clare Isl., Mayo.

Var. *memnonia* Wedd. in Mém. Soc. Sci. Nat. Cherb. xix. 301 (1875); Koerb. Syst. Lich. Germ. 340 (1855)?—Thallus thin, effuse, gelatinous, brownish-black with a light-coloured hypothallus, cracked in places when dry, but not areolate. Perithecia prominent, immersed in a swelling of the thallus; spores varying in size, ellipsoid, 12-20 μ long, 5-7 μ thick, or 10-15 μ long, 7-9 μ thick, sometimes almost round.—*V. memnonia* Flot. ex Koerb. *l. c.*?

Almost specifically distinct owing to the continuous thallus, the superficial cracks being due entirely to shrinking and occurring only on portions of the thallus. It is traversed in places by the greyish lines of the hypothallus. The apothecia when present are more prominent than in the species. Zschake in Hedwigia lxxv. 51 (1924) states that Weddell's plant differs from *V. memnonia* Flot., so he makes it a new species *V. pseudomemnonia*.

Hab. On maritime rocks and growing nearer the sea than the species.—*B. M.* Jerbourg, Guernsey; Baggy Point, N. Devon; Garwick, I. of Man; Silverdale, Lancashire; Portlethen, Kincardine.

2. *V. mucosa* Wahlenb. in Ach. Meth. Suppl. 23 (1803).—Thallus olivaceous or dark-greenish, smooth, gelatinous, opaque, continuous, thin or sometimes rather thick. Perithecia minute, immersed and scarcely visible above the thallus; perithecial wall dimidiate or almost entire; spores small, ellipsoid, colourless,

7–10 μ long, 4–6 μ thick or rather larger.—Carroll in Journ. Bot. iii. 292 (1865); Cromb. Lich. Brit. 113; Leight. Lich. Fl. 413; ed. 3, 444.

Exsicc. Larb. Lich. Hb. n. 278.

In the British specimens the spores are slightly narrower than the size given by Th. Fries in Lich. Arct. 269, measuring generally about 4 μ in thickness; Vainio (Lich. Fenn. 64, 1921) gives the size as 7–15 μ \times 4–8 μ . Weddell (Mém. Soc. Sci. Nat. Cherb. xix. 305 (1875)) calls attention to the very considerable variation in form and size of the spores of maritime lichens.

Hab. On maritime rocks, generally between tide-marks.—*Distr.* Rare in the Channel Islands, S. Wales, E. and W. Scotland, and N., S. and W. Ireland.—*B. M.* St. Aubin's Bay and St. Ouen's Bay, Jersey; Manorbeer Bay near Tenby, Pembrokeshire; Holy Island, Northumberland; Ardrishaig, Argyll; Achastle, Caithness; Caher Mountain, Kerry; Killary Bay, Connemara, Galway; Clare Isl. and Dugort, Achill Isl.; Mayo; Barclay's Rock, Down.

3. *V. microspora* Nyl. in Ann. Sci. Nat. sér. 4, iii, 175 (1855) (incl. f. *halophila*).—Thallus olivaceous or blackish-green, thin, continuous, gelatinous, smooth, effuse or determinate. Perithecia moderate in size, numerous, crowded, semi-immersed, black and shining, opening by a pore or somewhat depressed at the apex; perithecial wall dimidiate; spores minute, ellipsoid 7–11 μ long, 4–5 μ thick; hymenial gelatine faintly wine-red with iodine.—Carroll in Journ. Bot. iii. 292 (1865); Cromb. Lich. Brit. 113. *V. halophila* Nyl. ex Leight. Lich. Fl. 413; ed. 3, 445 (excl. syns. *V. aquatilis* and *V. leptotera*). *V. Whichcotii* Larb. ex Leight. ll. c. *V. littoralis* Tayl. in Hook. Lond. Journ. Bot. vi. 154 (1847)?

Exsicc. Larb. Lich. Hb. n. 195 & Lich. Cæsar. n. 100; Mudd n. 970 (as *V. maura*); Leight. n. 33 pro parte (as *V. maura*).

Differs from *V. mucosa*, to which it is closely allied, in the thinner thallus, and the more prominent perithecia. A specimen from Jersey labelled *V. littoralis* Tayl. is intermixed and almost obscured by the red encrusting alga, *Hildenbrandtia rosea*. Müller Argau (Flora lxxi. 550 (1888)) may have had a similar specimen, or part of a specimen in view when he referred the whole of Taylor's *V. littoralis* to the alga.

Hab. On maritime rocks or stones washed by the sea.—*Distr.* Sea coasts of the British Isles.—*B. M.* Grève-au-Lançon and St. Aubin's Bay, Jersey; Baggy Point, Mudstone and Brixham, Devon; Luccomb Chine, I. of Wight; Tenby, Pembrokeshire; Conway Bay, Carnarvonshire; Black Hall Rocks, Hartlepool, Durham.

Var. *mucosula* Wedd. in Mém. Soc. Sci. Nat. Cherb. xix. 303 (1875).—Thallus effuse, thinner than in the species and the perithecia smaller, less prominent; spores broader, almost globose 7–11 μ long, 4–8 μ thick.—M. C. Knowles, Sci. Proc. Roy. Dubl. Soc. xiv. 137 (1913).

Recorded by M. C. Knowles as "frequent in the upper part of neap-range" at Howth, Dublin.

4. **V. microsporoides** Nyl. in Bull. Soc. Bot. France, viii. 759 (1861).—Thallus dark-green or blackish, gelatinous, continuous, rather thin. Perithecia numerous, prominent, rather small (2–3 mm. wide), black, shining, the perithecial wall dimidiate or almost entire; spores ellipsoid, blunt at the ends, 10–14 μ long, 6–7 μ thick.—Carroll in Journ. Bot. iii. 293 (1865); Cromb. Lich. Brit. 114; Leight. Lich. Fl. 414; ed. 3, 445.

Included under *V. mucosa* in ed. i. 277 (1911), but in appearance nearer to the preceding, differing mainly in the larger spores. Zschake (Hedwigia, lxxv. 58 (1924)) records the finding of globose spores ($7 \times 7 \mu$) mixed with the others.

Hab. On maritime wave-washed rocks. *Distr.* Rare in the Channel Islands and in W. Ireland.—*B. M.* Coast of Alderney; Kilkee, Clare.

5. **V. Lorrain-Smithiæ** Knowles in Sci. Proc. Roy. Dubl. Soc. xiv. 138 (1913).—Thallus blackish-green, gelatinous, thin, continuous or sometimes almost evanescent. Perithecia excessively minute, about 120–180 μ in diam., scattered, hemispherical, shining, opening by a minute pore 15–20 μ in diam., dimidiate; ascus elliptical, 20–25 μ long, 10–12 μ wide; spores 8 in the ascus, simple, rod-like, oblong-elongate or slightly curved, 15–18 μ long, 2–4 μ thick.—A. L. Sm. Monogr. i. 482 (1918).

Characterized by the minute prominent perithecia. Bouly de Lesdain suggests its strong resemblance to *V. Sandstedei* B. de Lesd. in Bull. Soc. Bot. France, xi. 662 (1913), a lichen not yet recorded in our Islands. Zschake in Hedwigia, lxxv. 55 (1924), considers it to be a variety of that species with smaller perithecia and rather longer spores, and, we should add, with a more gelatinous thallus. The two lichens are evidently very closely related.

Hab. On limestone rock, below neap-range or more abundant near low-water mark.—*B. M.* Balseadden Bay, Howth, Dublin. (M. C. Knowles, Sept. & Dec., 1913.) Found also by W. Watson at Clevedon, Somerset.

6. **V. striatula** Wahlenb. in Ach. Meth. Suppl. 21 (1803).—Thallus shining black or greenish-black, gelatinous, consisting of numerous small elevated scattered ridges or lines irregularly or dendritically arranged. Perithecia minute, shining black, sessile, with a large depression at the apex; perithecial wall dimidiate; spores 8 in the ascus, colourless, ellipsoid, small, 8–12 μ long, 4–5 μ thick; hymenial gelatine wine-red with iodine.—Hook. in Sm. Engl. Fl. v. 155 (excl. syn.); Carroll in Journ. Bot. iii. 292 (1865); Cromb. Lich. Brit. 113; Leight. Lich. Fl. 414; ed. 3, 445. *Lithocia striatula* S. F. Gray Nat. Arr. i. 498 (1821) (excl. var.).

The thalline ridges are scattered or in somewhat crowded groups. They are formed from tips of the fungal hyphæ, which are blackish-green and arranged in short closely serried ranks. The perithecia are scattered among the ridges, and are usually sessile on the substratum.

Hab. On maritime rocks.—*Distr.* Rare in the Channel Islands and S. England, recorded also from Howth, Dublin, by M. C. Knowles.—*B. M.* Coast of Alderney; St. Aubin's Fort, Grève-au-Lançon and Plémont, Jersey; Jerbourg, Guernsey.

Form **continua** Knowles *l. c.*—Thallus more continuous than in the species, sometimes radiate, with scattered small dots and ridges.—A. L. Sm. *Monogr.* i. 482 (1918).

Hab. On maritime rocks in more sheltered situations and more abundant than the species.—*B. M.* Needles, Howth, Dublin. (M. C. Knowles, July, 1910.)

7. **V. scotina** Wedd. in *Mém. Soc. Sci. Nat. Cherb.* 298 (1875) c. descript.—Thallus brownish-black or umber-brown, thick or rather thin, effuse, scabrid or occasionally cracked-areolate, sometimes almost entirely evanescent. Perithecia black, prominent, conical or hemispherical, rather large; perithecial wall entire or subentire; spores ellipsoid, sometimes almost round, obtuse at the ends, 10–17 μ long, 5–9 μ thick, colourless.

Exsicc. *Larb. Lich. Cæsar.* n. 98 (as *V. margacea*).

Agrees with other maritime species in the very dark-coloured thallus but grows above tide-level and is less distinctly mucilaginous. Weddell noted (*l. c.*) an odour of violets due without doubt to some alga with which it is associated.

Hab. On rocks by the seashore above tide-level.—*Distr.* Rather rare in the Channel Islands (recorded also from Howth, Dublin).—*B. M.* Noirmont, Plémont near Ile Percée, Jersey.

8. **V. prominula** Nyl. in *Fl.* xliii. 546 (1860) (nomen.); Mudd *Man.* 291 (1861).—Thallus thin, greenish-white or brownish, tartareous, continuous, finely wrinkled, effuse or determinate. Perithecia large, prominent, scattered, subglobose or conical, black, depressed-umbilicate at the apex; perithecial wall entire; spores broadly oblong or ellipsoid, blunt at the ends, 12–17 μ or 18–20 μ long, 7–10 μ thick.—Carroll in *Journ. Bot.* iv. 25 (1866); *Cromb. Lich. Brit.* 113; *Leight. Lich. Fl.* 419; ed. 3, 449.

Well marked by the thinnish thallus and very prominent perithecia. It is evidently related to *V. grossa* (Nyl. *Hb. Mus. Fenn. App.* iii (1859)) and Vainio has suggested that it may be a variety (*Lich. Fenn.* 59 (1921)), but according to the description, there are various differences in the thallus, in the substratum (on calcareous rocks) and also in the larger spores of *V. grossa* which has not been recorded in Britain. Mudd's spore measurements are not trustworthy, but in the specimens examined they average the sizes given above. M. C. Knowles (*l. c.*) found *V. prominula* on shady rocks at Howth, Dublin.

Hab. Generally on maritime rocks, occasionally inland.—*Distr.* Rather rare in S. and N. England and in Ireland.—*B. M.* Combe St. Nicholas, near Chard, Somerset; Port Soderick, I. of Man; Kerry; Kilkee and Cliffs of Moher, Clare; Derryclare and Doughruagh Mt., Connemara, Galway.

Var. **viridans** Nyl. in Flora lxii. 224 (1879).—Thallus and perithecia as in the species; spores broadly oblong or almost globose, much smaller, 10–12 μ long, 7–9 μ thick.—Cromb. in Grevillea, viii. 30. *V. muralis* Tayl. in Mackay Fl. Hib. ii. 91 (1836) pro parte.

Exsicc. Larb. Lich. Hb. (without a number) (as var. *subviridans*).

Hab. On maritime rocks. Rare in S.W. and E. Ireland.—*B. M.* Kerry; Leenane, Connemara, Galway; Clare Isl., Mayo (recorded by M. C. Knowles from Howth, Dublin).

Var. **minor** A. L. Sm. Thallus scurfy, thin, greyish or brownish or almost evanescent. Perithecia numerous, scattered, smaller than in the species, hemispherical, shining, black; spores ellipsoid, 14–17 μ long, 6–7 μ thick.

Differs from the species in the smaller perithecia and spores.

Hab. On maritime and inland rocks.—*B. M.* Manorbier Tenby, Pembrokeshire.

Aquatic species growing in or near streams, etc.; thallus subgelatinous, continuous or becoming cracked-areolate.

9. **V. aquatilis** Mudd Man. 285, t. 5, fig. 121 (1861).—Thallus thin, continuous or in spots, mucilaginous, dull olive-black. Perithecia minute, numerous, semi-immersed or often covered by the thallus, slightly depressed at the apex, opening by a pore; perithecial wall black, dimidiate; asci small, saccate, 8-spored; spores small, broadly elliptical or subglobose, colourless, 6–8 μ long, 5–7 μ thick.—*V. margacea* var. *aquatilis* Cromb. Lich. Brit. 112.

Exsicc. Mudd n. 971.

Hab. On rocks and stones in the beds of upland streams and rivulets.—*Distr.* Rare in S.W. and N. England and Central Scotland.—*B. M.* Rowberrow, Somerset; Church Stretton, Shropshire; Malvern Hills, Worcestershire; Ayton, Cleveland, Yorkshire; Perth.

10. **V. imbrida** Tayl. in Hook. Lond. Journ. Bot. vi. 153 (1847).—Thallus effuse, thin, tartareous, equal, cracked, brownish-black, olivaceous when moist. Perithecia minute, immersed, scarcely visible, with a wide margined ostiole. Specimen not seen.

From the description, possibly allied to *V. aquatilis* or *V. hydrela*. Considered by Müller Argau (Flora lxxi. 550 (1888)) to be referable to the genus *Pyrenopsis* and quoted by Crombie under *P. subareolata* (Monogr. Brit. Lich. 24).

Hab. On smooth rocks near the spray of waterfalls; Kerry.

11. **V. rhodosticta** Tayl. l. c.—Thallus subtartareous, thin, verrucose, the verrucæ aggregate, purplish-black when dry, subgelatinous and reddish when moist, minutely wrinkled; perithecia scattered, subglobose, scabrid. Specimen not seen.

Considered by Taylor as allied to the previous species, also referred by Müller Argau (*tom. cit.* 551) to *Pyrenopsis*. The descriptions of both species are too incomplete for accurate identification.

Hab. On wet rocks near Sheen Bridge, Kerry.

12. *V. hydrela* Ach. Syn. 94 (1814); Garovaglio Tent. Disp. Meth. Lich. 22, t. 1, f. 2 (1864).—Thallus olivaceous or olive-brown, becoming almost black in parts when dry, effuse or determinate, smooth, thin or often thickish, gelatinous, becoming subtartareous, continuous, then somewhat irregularly cracked, smooth, sometimes unequal. Perithecia moderate in size, semi-immersed, the apex alone free, subglobose, black; perithecial wall dimidiate or continued below the base in a thin layer; spores ellipsoid, rather large, 17–28 μ long, 7–18 μ thick.—Mudd Man. 285; Leight. Lich. Fl. 416; ed. 3, 447 (note); Shackleton & Hebden in Naturalist 1892, 17. *V. lævata* Leight. Angioc. Lich. 44, t. 19, f. 1 (1851) pro parte; *f. nigrata* Lich. Fl. ed. 3, 449 (1879). *V. elæomelæna* Massal. in Atti. Istit. Ven. 1857, 380, t. 5, figs. 1–4; Cromb. in Journ. Bot. xiv. 363 (1876). *V. margacea* var. *hydrela* Nyl. in Maine et Loire, Mém. Soc. Acad. iv. 26 (1858); Cromb. Lich. Brit. 112. *Lithoidea elæomelæna* Massal. l. c.

Ersicc. Cromb. n. 198 (as *V. elæomelæna*); Leight. n. 198 (as *V. lævata*).

Distinguished from allied species by the continuous unequal thallus; the spores measure up to 12 μ thick in the specimens examined. Menzies has found a specimen at Perth with spores 20 $\mu \times$ 18 μ .

Hab. On rocks which are often under water.—*Distr.* Rare in Central and W. England, and the Grampians, Scotland.—*B. M.* Bewley Down, Somerset; on rocks in streams, Chedworth, Gloucestershire; Malvern, Worcestershire; Craigforda and near Abdon, Shropshire; Carnedd Dafydd, Carnarvonshire; bed of the Wye, Buxton, Derbyshire; Staveley and Windermere, Westmorland; Perth; Lough Feagh, Connemara, Galway.

13. *V. lævata* Ach. Lich. Univ. 284 (1810).—Thallus pale-greyish-brown, rather thick, continuous or cracked-areolate, whitish towards the edges and determinate, with a dark-coloured hypothallus. Perithecia immersed, the black shining ostiole emerging; perithecial wall entire, thickish; spores 8 in the ascus, ellipsoid, large, 18–24 μ long or longer, 10–11 μ thick; hymenial gelatine wine-red with iodine.—Borr. in Sm. Engl. Bot. Suppl. n. 2623, f. 2; Hook. in Sm. Engl. Fl. v. 153; Tayl. in Mackay Fl. Hib. ii. 91; Leight. Angioc. Lich. 44, t. 19, f. 1 pro parte & Lich. Fl. 418; ed. 3, 449; Mudd Man. 286.

Ersicc. Mudd n. 273.

Closely allied to the preceding but distinguished by the more persistently lighter-coloured deeply-cracked areolate thallus, by the covered perithecia and by the proportionately narrower spores. These differences might possibly be considered as due to the more constant

immersion: in that case *V. hydrela* would rank as a variety or growth form of the previously described plant.

Hab. On rocks and stones usually in streams.—*Distr.* In upland districts, rare in N. England, the Grampians, Scotland, and S. and W. Ireland.—*B. M.* River Ithon, Llandrindod, Radnorshire; Airyholme Wood, Cleveland, Yorkshire; Ben Lawers, Perthshire; Cork; Blackwater Bridge, Killarney, Kerry.

14. *V. degenerascens* Nyl. ex Larb. Lich. Hb. n. 200, nomen.—Thallus dark-brown, moderately thick, subdeterminate, mucilaginous when moist, continuous, then irregularly cracked, not distinctly areolate. Perithecia minute, semi-immersed, slightly depressed round the prominent ostiole; perithecial wall black, entire, thick above, continued beneath the base by a thinner layer; spores somewhat oblong, narrower at one end, 17–rarely 20 μ long, 5–7 μ thick.

Exsicc. Larb. Lich. Hb. n. 200.

Differing from the two preceding species in the drier habitat, in the smooth superficially cracked thallus and in the smaller spores.

Hab. On rocks.—*B. M.* Ben-y-Gloe, Perthshire; Island on Lough Feagh, Connemara, Galway.

15. *V. margacea* Wahlenb. Fl. Lapp. 465 (1812).—Thallus olive- or greyish-brown, thin, smooth, somewhat shining, continuous, effuse or determinate. Perithecia moderate in size, immersed in the thallus, becoming emergent, opening by a pore, the perithecial wall dimidiate, or thinly developed under the base; spores ellipsoid or oblong, rather large, 24–35 μ long, 10–16 μ thick or rather larger; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. 111 (excl. vars.); Leight. Lich. Fl. 416; ed. 3, 446 (excl. vars.). *V. submersa* Borr. in Sm. Engl. Bot. Suppl. t. 2768 (1833). *V. Leightonii* Hepp Flecht. Eur. n. 95 (1853); Mudd Man. 287 pro parte. *Thelotrema margacea* Wahlenb. ex Ach. Meth. Suppl. 30 (1803).

On moist rocks often about the margins of streams.—*Distr.* Rather rare throughout the British Isles.—*B. M.* Trefriw Falls, Bettws-y-Coed, Carnarvonshire; Dan Hill and Staveley, Westmorland; Craig Tulloch, Blair Athole and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; near Ballinhassig, Cork; Caher Mt., Kerry.

16. *V. latebrosa* Kærh. Syst. Lich. Germ. 349 (1855).—Thallus reddish-grey, effuse, thin, faintly areolate. Perithecia moderate in size, somewhat shining black, sessile more or less covered at the base by the thallus; perithecial wall dimidiate; spores usually 8 in the ascus, large, ellipsoid, becoming slightly brownish, 30–35 μ long, 12–15 μ thick.—Leight. Lich. Fl. ed. 3, 448.

Exsicc. Larb. Lich. Hb. n. 237.

Nearly allied to the preceding but with a less gelatinous thallus and more emergent perithecia.

Hab. On rocks.—*Distr.* Rare in Scotland and W. Ireland.—*B. M.* Near Perth; on loose stones, Kylemore Lake, Connemara, Galway.

17. *V. æthiobola* Wahlenb. ex Ach. Meth. Suppl. 17 (1803).—Thallus dark- or light-olivaceous, effuse, thin, gelatinous when moist, sometimes slightly cracked. Perithecia moderate in size, numerous, black, at first covered by the thallus, then emergent; perithecial wall entire or thinly developed at the base; spores ellipsoid, 14–24 μ long, 6–10 μ thick or larger; hymenial gelatine wine-red with iodine.—Winch. Bot. Guide ii. 45 (1807). *V. margacea* var. *æthiobola* Nyl. Lich. Scand. 272 (1861); Salw. in Trans. Bot. Soc. Edin. vii. 556 (1863); Cromb. Lich. Brit. 111; Leight. Lich. Fl. 416; ed. 3, 447. *V. devergescens* Nyl. in Flora lx. 462 (1877)? Cromb. in Grevillea vi. 114; Leight. Lich. Fl. ed. 3. 448.

Exsicc. Leight. n. 32 (as *V. irrigua* Tayl. var. *erysiboda* Leight.).

Very near to *V. margacea*, but with more emergent perithecia and subentire peridium.

V. devergescens has been included as the specimen in the British Museum bearing the same date and from the same locality as the type is identical with *V. æthiobola*. Nylander gives a larger size for the spores, 19–29 μ long, and a specimen which grew in a drier situation has been described by B. de Lesdain as having spores 19–33 $\mu \times$ 8–10 μ and with more prominent perithecia (Bull. Soc. Bot. Fr. v. 625 (1905)).

Hab. On wet rocks.—*Distr.* Rather rare in S.W. and N. England and in S. and W. Ireland.—*B. M.* Withiel, Cornwall; Dartmouth, Devon; Fishguard, Pembrokeshire; Dolgelly, Merioneth; Ffridd-ddu, near Aber, Carnarvonshire; Ayton, Bilsdale and Sowerdale, Cleveland, Yorkshire; Hensham Head and Bowness, Westmorland; near Ballinhassig and near Cork; Caher Mt., Dunkerron and Blackwater Bridge, Kerry; Doughruagh Mt. and Letterfrack, Connemara, Galway.

Var. *acrotella* A. L. Sm.—Thallus thin, dispersed or generally evanescent. Perithecia small, hemispherical, crowded or scattered, the perithecial wall spreading at the base; spores as in the species?—*V. acrotella* Ach. Meth. 123 (1803); Tayl. in Mackay Fl. Hib. ii. 94; Cromb. Lich. Brit. 115 (excl. syn.). *V. margacea* var. *acrotella* Leight. Lich. Fl. 417 (1871); ed. 3, 448 (excl. syn.). *Lichen acrotellus* Sm. Engl. Bot. t. 1712 (1807). *Lithocia striatula* var. *acrotella* S. F. Gray Nat. Arr. i. 498 (1821).

Considered by most Continental botanists to represent a form allied to *V. æthiobola* but always imperfectly developed. The Sowerby specimen has no spores, but one from Ireland, determined by Nylander as *V. acrotella*, though without thallus, has minute scattered apothecia and spores 21 μ long, 7 μ thick; Vainio in Lich. Fenn. i. 40 (1921) gives spore sizes as 11–21 $\mu \times$ 7–9 μ .

Hab. On stones in rather drier situations.—*Distr.* Rare in S. England and in S.W. and N. Ireland.—*B. M.* Withiel, Cornwall; Great Bedwyn, Wilts; Aldington Beach, Kent; Dolgelly, Merioneth; near Perth; Ireland.

18. **V. submersa** Schær. Spicil. 334 (1836) (non Borr.).—Thallus determinate, thin, smooth, somewhat gelatinous, greenish when moist, becoming greyish when dry, here and there slightly cracked. Perithecia small, immersed, then semi-emergent, sometimes surrounded at the base by a slight elevation of the thallus; perithecial wall dimidiate or continuous under the base in a thin layer: spores ellipsoid, 15-24 μ long, 6-10 μ thick or larger.—Mudd Man. 286. *V. chlorotica* Hepp Flecht. Eur. n. 94 (1853)? (non Ach.); Mudd Man. 285. *V. margacea* var. *submersa* Cromb. Lich. Brit. 112 (1870).

Exsicc. Leight. n. 34 (as *V. chlorotica*); Mudd n. 272.

Differs from *V. æthiobola* in the lighter-coloured and usually better developed more continuous thallus, forming a transition between it and *V. papillosa*. In some specimens the spores are persistently small, usually they measure about the same size as those of *V. papillosa*.

Hab. On rocks and stones in moist situations.—*Distr.* Rare in N. and W. England, N.W. Scotland, and in S. and W. Ireland.—*B. M.* Wotton-under-Edge and Cirencester, Gloucestershire; Tintern Abbey, Monmouthshire; Malvern, Worcestershire; Great Orme's Head, Carnarvonshire; near Wrexham, Denbighshire; near Aytton and Kildale, Cleveland, Yorkshire; I. of Man; I. of Lismore, Argyll; near Perth; Ballinhassig, Glanmire Road, Cork; Blackwater Bridge, Kerry.

19. **V. papillosa** Ach. Lich. Univ. 286 (1810).—Thallus somewhat gelatinous when moist, greyish or sometimes olivaceous, cracked into small irregular areolæ, effuse or determinate. Perithecia immersed then semi-emergent from a slight elevation of the thallus; perithecial wall dimidiate or continuous under the base in a thin layer: spores ellipsoid, 18-24 μ long, 6-10 μ thick. Leight. Angioe. Lich. 54, t. 24, fig. 1; Mudd Man. 287. *V. margacea* var. *papillosa* Nyl. Lich. Scand. 272 (1861); Cromb. Lich. Brit. 112; Leight. Lich. Fl. 417; ed. 3. 447.

Exsicc. Mudd n. 274 (thallus poorly developed). *Larb.* Lich. Hb. n. 159 (as *V. æthiobola*).

Closely allied to the preceding, from which it differs only in the usually rather thicker more areolate thallus and the more papillose appearance of the larger perithecia which emerge from slight swellings of the thallus. A specimen tentatively named *V. papillosoides*, but evidently *V. papillosa*, has been sent by Dr. Watson. It was collected near Taunton in drier situations than is usual for the species, and is non-gelatinous.

Hab. On rocks and stones in moist situations.—*Distr.* Rather rare in the Channel Islands, S.W. and N. England and W. Ireland.—*B. M.* St. Lawrence Hill, Jersey; Newlyn, Cornwall; Ditcham, and near Totnes, Devon; Shanklin, I. of Wight; near Taunton, Somerset; Worcester; near Tenby, Pembrokeshire; Talsarman, Merioneth; Sowerdale, Cleveland, Yorkshire; Dan Hill, Westmorland; near Perth; Kileully, Cork; Killarney, Kerry; Killary Bay and near Lettermore, Connemara, Galway; Westport, Mayo.

Thallus in dry situations crustaceous or cartilaginous, cracked-areolate, effuse.

20. **V. viridula** Ach. Meth. Lich. Suppl. 16 (1803).—Thallus effuse, tartareous or crustaceous, generally thickish, pale or greenish-olive-brown, sometimes clear-green when moist, cracked-areolate, the areolæ irregular smooth or wrinkled or verrucose. Perithecia black, large, deeply immersed, the upper part visible; perithecial wall black, thick over the upper half continued by a thin black layer under the base; spores broadly ellipsoid, large, 18–35 μ long, 10–17 μ thick.—Borr. in Sm. Engl. Bot. Suppl. after t. 2623, fig. 2 (text); Hook. in Sm. Engl. Fl. v. 153; Tayl. in Mackay Fl. Hib. ii. 91? Mudd Man. 289; Cromb. Lich. Brit. 111 (excl. var. *glauca*, incl. subsp. *subfuscella*); Leight. Lich. Fl. 424; ed. 3, 455. *V. virens* Nyl. in Bot. Not. 1853, 180; Salw. in Trans. Bot. Soc. Edin. vii. 537 (1863)? *V. nigrescens* subsp. *subfuscella* Nyl. Lich. Scand. 271 (1861). *V. mortarii* Leight. Lich. Fl. ed. 3, 546 (non Arn.). *Endocarpon viridulum* Schrad. Spicil. Fl. Germ. 192 (1794). *Lichen tessellatus* Sm. Engl. Bot. t. 533 (1798)? *Pyrenula tessellata* S. F. Gray Nat. Arr. i. 493 (1821)? *Sagedia viridula* Fr. Lich. Eur. 414 (1831); Leight. Angioc. Lich. 23, t. 7, fig. 3.

Exsicc. Bohl. n. 89, pl.; Johns. n. 517; Leight. nos. 98, pro parte (as *Endocarpon lithinum*), 140 (as *V. rupestris*), 229; Mudd n. 279; Larb. Lich. Hb. without a number (as *V. mortarii*).

Somewhat variable in the development of the thallus, which is usually rather thick and deeply cracked, though it may become almost evanescent; it varies in colour, from light greyish-green to a dirty-brownish colour (subsp. *subfuscella*). There is considerable similarity between it and *V. papillosa*, but the thallus of the latter species is thinner, and perithecia and spores smaller. There is no authentic *Verrucaria virens* Nyl. in the herbarium of the British Museum. A specimen so labelled, from Arnside, Westmorland, is a form of *V. viridula*. Nylander's description hardly warrants specific distinction.

I have not seen Arnold's specimen of *V. mortarii*; the one recorded from Quy Churchyard, Cambridgeshire, is a growth form of *V. viridula*.

Hab. On mortar, old walls, rocks, &c.—*Distr.* Common in the Channel Islands and throughout England, rarer in Scotland and Ireland.—*B.* M. Alderney; St. Minver and Withiel, Cornwall; Plymouth and Torquay, Devonshire; Bembridge and Shanklin, I. of Wight; Midhurst Bridge and Petworth, Sussex; Hythe, Kent; Reigate, Surrey; Hempstead, Gloucestershire; Beveré and near Pershore, Worcestershire; Ulting and Walthamstow, Essex; Whitecliff Rocks, near Ludlow, and Much Wenlock, Shropshire; Shelton, Bedfordshire; Twycross, Gracedieu and Breedon-on-the-Hill, Leicestershire? (sterile thallus on an old leather sole); Quy, Cambridge; Bilsdale, near Guisboro' and Ayton, Cleveland, Yorkshire; Harlech, Merioneth; Llangollen, Denbighshire; Castle Eden Dean, Durham; Dan Hill, Heversham and Arnside, Westmorland; St. Bees, Cumberland; near Perth; near Aberdeen; near Cork; Derryquin, Kerry; Tully, Kylemore and Dawros River, Connemara, Galway.

21. **V. ochrostoma** Mudd Man. 290 (1861).—Thallus thickish, crustaceous, warted and wrinkled, cracked-areolate, varying in colour from dusky-cream or grey to olive, brownish-black or umber. Perithecia immersed, then partly emergent, black (brownish at an early stage); perithecial wall thin, entire; spores oblong or elliptical, 18–22 μ long, 10 μ thick.—Cromb. Lich. Brit. 111; Leight. Lich. Fl. 424; ed. 3, 454. *Sagedia ochrostoma* Borr. ex Leight. Angioc. Lich. 23, t. 7, fig. 4 (1851).

Very similar in the appearance of the thallus to some states of the preceding, of which it is perhaps only a form. The perithecia are brownish when young.

Hab. On mortar and rocks.—*B. M.* Near Henfield, Sussex; Llanbedr, Merioneth.

22. **V. macrostoma** DC. Fl. Franc. ii. 319 (1805).—Thallus tawny-brownish, cartilaginous, rather thick, cracked-areolate, the areolæ subsquamulose or raised into irregular warts. Perithecia black, rather large, immersed in the areolæ, with more or less prominent ostioles; perithecial wall black, thick above, spreading at the base with a thinner layer underneath; spores ellipsoid, rather large, 25–35 μ long, 12–15 or 20 μ thick.—Leight. Angioc. Lich. 48, t. 21, fig. 4 & Lich. Fl. 423; ed. 3, 454 (spore measurements too small). *V. nigrescens* var. *macrostoma* Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. 192 (1855); Mudd Man. 289; Cromb. Lich. Brit. 110.

Exsicc. Mudd n. 278; Larb. Lich. Cæsar. n. 97 & Lich. Hb. 239 (as *Verrucaria incrustans* Nyl. nomen nudum, 1880).

Distinguished from allied species by the subsquamulose brown thallus. Not unlike *Dermatocarpon macrocarpon*, which should perhaps be included here, though the spore sizes of that species are larger and the thallus more distinctly squamulose. Here also is included *Verrucaria incrustans*: the thallus is of swollen olivaceous warts when moist, darker when dry; the perithecia immersed, entire; spores oblong-ovoid, 23–30 μ long, 15–20 μ thick, but imperfectly developed. The specimen came recently into the possession of the British Museum with the Martindale herbarium. It was found in the interstices of old walls at Thetford, Norfolk.

Hab. On walls and mortar.—*Distr.* Not common in the Channel Islands, S.W. and N. England, rare in Scotland and Ireland.—*B. M.* Alderney; St. Aubin's and St. Brelade's, Jersey; near Penzance, Cornwall; near Torquay, Devon; Falmer, Climping and Danny, Sussex; Stratton and Cowcombe Wood, Gloucestershire; near Shrewsbury, Shropshire; Worcester; Harlech Castle, Merioneth; near Guisboro', Cleveland, Yorkshire; Thetford, Norfolk; Middleton, Cork.

Form aphanostoma Shackleton & Hebden in Naturalist 1892, 17.—Differs from the species in the smaller ostioles and in the somewhat larger spores, 26–36 μ long, 16–20 μ thick.

Hab. On mortar, wall-tops and sandstone.—*B. M.* Malsis, Crosshills, near Keighley, Yorkshire.

23. *V. thrombioides* Massal. Mém. Lich. 144 (1853).—Thallus brownish-red, cartilaginous, shining, becoming cracked-areolate, effuse. Perithecia large, black, immersed, the apex projecting, depressed; perithecial wall thick and black, dimidiate, with a thin black layer beneath the base; spores broadly oblong or oblong-ellipsoid, rather large, $24-30\ \mu$ long, $14-16\ \mu$ thick or rather larger. Leight. Lich. Fl. ed. 3, 452.—*Lithoiccia thrombioides* Baglietto ex Massal. Symm. Lich. 89 (1855).

Leighton records a specimen collected by W. Joshua in Cowcombe Wood, Gloucestershire, but the one in the British Museum that bears that label is identical with *V. macrostoma*.

Hab. On walls.—*Distr.* W. England (Cowcombe Wood, Gloucestershire), *vide* Leighton.

24. *V. aquilella* Nyl. in Flora lix. 237 (1876).—Thallus reddish-brown, minutely areolate or areolate-granulate, thin. Perithecia almost superficial; perithecial wall black, dimidiate; spores ellipsoid, simple, $18-22\ \mu$ long, $7-9\ \mu$ thick.—Cromb. in Journ. Bot. xiv. 362 (1876) & in Grevillea v. 29; Leight. Lich. Fl. ed. 3, 451.

The specimens of this and the following species in the British Museum were collected at the same time and place as the type specimens sent to Nylander and agree outwardly with the descriptions given, but the spores, though at first simple, become finally 1- or more-septate.

Hab. On micaceous rocks.—*B. M.* Lough Feagh, Connemara (the only locality).

25. *V. fusco-cinerascens* Nyl. in Flora lix. 310 (1876).—Thallus greyish-brown, cracked-areolate, unequal, thin. Perithecia black, semi-immersed; perithecial wall entirely black; spores oblong, $22-27\ \mu$ long, $8-10\ \mu$ thick.—Cromb. in Grevillea v. 29; Leight. Lich. Fl. ed. 3, 451.

The specimen from the Martindale herbarium agrees with the description given by Nylander.

Hab. On micaceous rocks.—*B. M.* Bowness, Westmorland; Dawros River, Connemara, Galway?

Thallus crustaceous or cartilaginous, continuous or cracked-areolate, determinate.

26. *V. nigrescens* Pers. in Ust. Ann. Bot. xiv. 36 (1795).—Thallus brown or nearly black, tartareous, cracked-areolate, or uneven, thin or thickish, determinate, with a black hypothallus. Perithecia of a medium size, immersed, then more or less projecting, usually numerous; perithecial wall entire, thick above, spreading at the base, with a thinner layer below; spores oblong, $15-24\ \mu$ long, $5-9\ \mu$ thick or occasionally larger; hymenial gelatine wine-red with iodine.—Hook. in Sm. Engl. Fl. v. 155; Leight. Angioc. Lich. 62, t. 27, fig. 1 & Lich. Fl. 420; ed. 3,

450; Mudd Man. 289; (Cromb. Lich. Brit. 110 pro parte. *V. umbrina* Ach. Meth. 122 (1803) (non Schær.); Tayl. in Mackay Fl. Hib. ii. 93. *V. neglecta* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. 32, t. 1, fig. 1 (1854). *V. ovata* Deakin *tom. cit.* 34, t. 2, fig. 4. *V. Leightonii* var. *umbrina* Mudd Man. 287 (1861). *Lichen umbrinus* Ach. Lich. Suec. Prod. 14 (1798); Sm. Engl. Bot. t. 1499. *Pyrenula nigrescens* Ach. Syn. 126 (1814); Hook. Fl. Scot. ii. 46; S. F. Gray Nat. Arr. i. 494.

Exsicc. Mudd n. 277; Leight. n. 101 (as *V. umbrina*); Johns. n. 518.

The thallus varies in colour from brownish-grey to dark-reddish-brown or dull-brownish-black. The hypothallus forms a black line at the edge, but occasionally, as on flints, it is rather spreading.

Hab. On rocks, stones, bricks, mortar, &c., especially in calcareous districts.—*Distr.* Frequent in the Channel Islands, England and Wales, somewhat rare in Scotland and Ireland.—*B. M.* St. Merryn and Penzance, Cornwall; Shanklin, I. of Wight; Torquay, Devon; Lyme Regis, Dorset; Goring, Brighton and Malling Down, Sussex; Reigate and Shere, Surrey; Little Baddon and Epping Forest, Essex; Dyke Hill, Oxfordshire; Knightsford Bridge and Malvern, Worcestershire; Harboro Magna, Warwickshire; near Chepstow, Monmouthshire; Tenby, Pembrokeshire; Llanymynech, Shropshire; Pwllheli, Geganwy, near Conway and Nevin, Carmarvonshire; Aberdovey and Dolgelly, Merioneth; Kentmere Hall, near Kendal, Heversham and near Arnside, Westmorland; Carlton Bank and Ayton, Cleveland, Yorkshire; Fore-shield, Cumberland; Drumadoon, Arran; Ben Lawers, Perthshire; Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; Ringaskiddy and near Cork; Ballinakill, Galway.

27. *V. mauroides* Schær. Spicil. Lich. Helv. 335 (1836).—Thallus thin, dark umber-brown, subdeterminate, continuous or faintly cracked-areolate. Perithecia small, numerous, immersed in the thallus, scarcely emergent, hemispherical, black; perithecial wall continuous under the base in a thin black layer; spores oblong-ellipsoid, 16-22 μ long, 8-10 μ thick or larger.—Leight. Lich. Fl. 420; ed. 3, 450. *V. umbrina* Leight. Angioc. Lich. 52, t. 23, fig. 2 (1850) (non Ach.)? *V. Leightonii* var. *umbrina* Mudd Man. 287 (1861)? *V. margacea* var. *mauroides* Nyl. in Helsingf. Bidr. Finl. Nat. iv. 235 (1859); (Cromb. Lich. Brit. 112 (1870).

Frequently regarded as a subspecies or variety of the preceding, but distinguished by the thinner more effuse less areolate thallus, the minute areolæ being more easily seen when moist.

Hab. On rocks and stones chiefly arenaceous or quartzose.—*Distr.* Not common throughout the British Isles.—*B. M.* Market Harborough, Leicestershire; Malvern, Worcestershire; Dolgelly, Merioneth; Carlton Bank and near Ayton, Cleveland, Yorkshire; Staveley, Westmorland; near Perth; Clare Island, Mayo.

28. *V. cataleptoides* Nyl. in Bull. Soc. Bot. Fr. x. 268 (1863).—Thallus thickish, dark-brown or blackish, cracked-areolate,

determinate. Perithecia immersed in the thallus, becoming emergent and prominent; perithecial wall black or brownish-black; spores ellipsoid, narrower at the ends, 18–24 μ long, 10–12 μ thick.—*V. margacea* var. *cataleptoides* Nyl. in Act. Soc. Linn. Bord. sér 3, i. 428 (1856).

Hab. On rocks, granitic or schistose.

Form *ferruginosa* Lamy Catal. Lich. 160 (1880).—Thallus bright ochraceous-red, cracked-areolate; spores 18 μ long, 8 μ thick.—Shackleton & Hebden in Naturalist, 1892, 17. *V. margacea* var. *cataleptoides* f. *ferruginosa* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 26 (1868).

The specimen from Yorkshire had spores 19–23 μ long, 9–11 μ thick.

Hab. On limestone crags.—*B. M.* Malham, Yorkshire.

29. *V. coerulea* DC. Fl. Franc. ii. 318 (1805); Schær. Enum. 216 (1850).—Thallus bluish-lead-coloured, greyish or greyish-brown, rather thick, determinate, faintly cracked-areolate. Perithecia black, small, semi-immersed, scarcely prominent, slightly depressed at the ostiole; perithecial wall thick, entire; spores ellipsoid or oblong, 14–19 μ long, 4–7 μ thick; hymenial gelatine wine-red with iodine.—*V. plumbea* Ach. Lich. Univ. 285 (1810); Hook. in Sm. Engl. Fl. v. 153 (1833); Tayl. in Mackay Fl. Hib. ii. 91; Leight. Angioc. Lich. 45, t. 19, fig. 5 & Lich. Fl. 421; ed. 3, 452; Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. 36, t. 3, fig. 8 (1854); Mudd Man. 288 (incl. var. *cineracea*); Cromb. Lich. Brit. 111. *Lichen coeruleus* Ramond ex DC. l. c. *L. plumbeus* Sm. Engl. Bot. t. 2540 (1814). *Lithocia plumbea* S. F. Gray Nat. Arr. i. 497 (1821).

Exsicc. Mudd n. 275 (as *V. plumbea* var. *cineracea*).

The thickish, sometimes orbicular thallus is limited and occasionally intersected by the dark-coloured hypothallus.

Hab. On calcareous rocks.—*Distr.* Uncommon in W. and N. England, W. Scotland and in S. and W. Ireland.—*B. M.* Hazleton, Gloucestershire; Buxton, Derbyshire; near Rievaulx and Newton Wood, Cleveland, Yorkshire; Whitbarrow and Arnside, Westmorland; Craig Tulloch, Perthshire; I. of Lismore, Argyll; Kenmare, Kerry; Dromoland, Clare.

30. *V. murina* Leight. Angioc. Lich. 44, t. 19, fig. 3 (1851).—Thallus mouse-grey or brownish, thin, effuse, continuous and slightly pulverulent or occurring in spots and determinate. Perithecia small, numerous, semi-immersed, prominent; perithecial wall thickish, black, entire; spores ellipsoid, 18–24 μ long, 6–12 μ thick.—Mudd Man. 291; Cromb. Lich. Brit. 115; Leight. Lich. Fl. 425; ed. 3, 455. *V. myriocarpa* Hepp Flecht. Eur. n. 430 (1857); Cromb. in Journ. Bot. xiv. 362 (1876); Leight. Lich. Fl. ed. 3, 456.

Exsicc. Larb. Lich. Hb. n. 160 (as *V. myriocarpa*).

Distinguished by the thin continuous thallus and numerous almost superficial perithecia. Sometimes a black hypothallus forms a line at the circumference.

Hab. On rocks.—*Distr.* Rare in S. and N. England and in S. and W. Ireland.—*B. M.* near Cirencester, Gloucestershire; Hartlepool, Durham; Cleghan, Connemara, Galway.

Var. *pusilla* A. L. Sm.—Thallus bluish-grey, thin, somewhat pulverulent. Perithecia as in the species; spores smaller, 12–15 μ long, 5–6 μ thick.—*Verrucaria fugax* Deakin in Ann. & Mag. Nat. Hist. ser. 2, xiii. 35 (1854); *V. myriocarpa* var. *pusilla* Arn. in Flora xlvii. 599 (1864).

Hab. On calcareous rocks.—*Distr.* Rare in S.W. England.—*B. M.* Torquay, Devon.

31. *V. pinguicula* Massal. in Lotos vi. 80 (1856); emend. Koerb. Parerg. 379 (1863).—Thallus in determinate patches, cartilaginous, continuous or finely cracked-areolate, umber-brown, limited by a dark line. Perithecia minute, hemispherical, immersed, the apex only visible; spores ellipsoid, minute, 12 μ long, 4 μ thick.

Described by Massalongo as having a deeply cracked thallus, and redescribed as above by Koerber, who says (*l.c.*) that Massalongo's description was incorrect.

Hab. On calcareous rocks.—*B. M.* Bilsdale, Yorkshire.

32. *V. peloclitia* Nyl. in Flora, lx. 461 (1877).—Thallus grey or greyish-brown, thin, smooth, cracked-areolate, determinate. Perithecia semi-immersed, becoming rather prominent; perithecial wall black, entire; spores oblong, rather small, 11–15 μ long, 5–6 μ thick.—Cromb. in Grevillea vi. 114 (1878); Leight. Lich. Fl. ed. 3, 452.

Considered by Nylander (*l.c.*) as closely allied to *V. truncatula*, a Pyrenean lichen. It strongly resembles *V. coerulæ*, but with smaller spores.

Hab. On calcareous rocks.—*B. M.* Whitbarrow, Westmorland; Twelve Pins, Kylemore, Connemara, Galway.

Form *continuella* Nyl. ex Shackleton & Hebden in Naturalist, 1892, 17.—Thallus white or greenish, continuous.

Hab. On damp rocks.—*B. M.* Malham, Yorkshire.

33. *V. glaucina* Ach. Lich. Univ. 675 (1810).—Thallus glaucous or leaden-grey, thickish, crustaceous-cartilaginous, deeply cracked-areolate, determinate, the areolæ smooth, plane, edged with the predominant blackish hypothallus. Perithecia blackish, immersed one or more in each areola, sometimes confluent, the ostiole becoming somewhat prominent; perithecial wall black, entire; spores ellipsoid, 10–20 μ long, 5–8 μ thick.—Leight. Lich. Fl. 423; ed. 3, 453. *V. polysticta* Borr. in Sm. Engl. Bot.

Suppl. t. 2741 (1832) (text); Tayl. in Mackay Fl. Hib. ii. 94; Leight. Angioc. Lich. 49, t. 21, fig. 5 & Lich. Fl. 422; ed. 3, 453; Mudd Man. 288; Cromb. Lich. Brit. 111. *V. viridula* var. *glaucina* Ach. Lich. Univ. 675 (1810); Cromb. Lich. Brit. 111. *V. fuscella* var. *glaucina* Schær. Enum. 215 (1850); Mudd Man. 289. *Lithocia glaucina* S. F. Gray Nat. Arr. i. 497 (1821). *Endocarpon polystictum* Borr. l. c. (plate).

Ersicc. Larb. Lich. Hb. n. 238 (as *V. polysticta*).

Often confused with *V. fuscella* on account of the predominant hypothallus which is visible more or less through the cracks of the grey thallus and gives the whole plant a dark appearance.

Hab. On calcareous rocks and walls.—*Distr.* Not uncommon in the Channel Islands and S. England, rare in N. and W. England, also recorded from N. and S.W. Ireland.—*B. M.* Alderney; Plymouth, Devon; Edburton Downs, Little Danny, Glynde, Hurst and Falmer, Sussex; Luccomb, I. of Wight; Lenham, Kent; St. Vincent's, near Bristol, Gloucestershire; Llanymynech, Shropshire; Saffron Walden, Essex; Northampton; Bilsdale, Yorkshire; near Cromer, Norfolk; Arnside, Westmorland; Ireland.

Subsp. *canella* A. L. Sm.—Almost similar to the species but with larger somewhat fusiform spores, colourless, becoming brownish, 25–32 μ long, 7–11 μ thick.—*Verrucaria canella* Nyl. in Flora lxvi. 102 (1883); Cromb. in Grevillea xii. 91.

Hab. On calcareous rocks.—*Distr.* Rare in N. England and N. Wales (Bangor, Carnarvonshire).—*B. M.* Clapham, Yorkshire; Eglwyseg Rocks, Llangollen, Denbighshire.

34. *V. fuscella* Winch Bot. Guide ii. 45 (1807).—Thallus dark-greyish-brown, thickish, cartilaginous, deeply cracked-areolate, the areolæ smooth, bordered with black from the predominant hypothallus, determinate. Perithecia minute, immersed in the areolæ, the ostiole nearly plane or depressed, scarcely visible; perithecial wall pale-brownish-coloured; spores 8 in the ascus, oblong-ellipsoid, simple, then occasionally becoming 1-septate, 11–16 μ long, 4–6 μ thick.—Ach. Lich. Univ. 289 (1810); Mudd Man. 288 (excl. var. *glaucina*); Cromb. Lich. Brit. 111; Leight. Lich. Fl. 422; ed. 3, 453. *Lichen fuscellus* Turn. in Trans. Linn. Soc. vii. 90, t. 8, fig. 2 (1804); Engl. Bot. t. 1500. *Endocarpon fuscellum* Ach. tom. cit. 675; Hook. in Sm. Engl. Fl. v. 159 (excl. syn. *E. tephroides* var. *polythecium*); Tayl. in Mackay Fl. Hib. ii. 101. *Sagedia fuscella* Fr. Lich. Eur. 413 (1831); Leight. Angioc. Lich. 22, t. 7, fig. 2.

Ersicc. Mudd n. 276.

Differs from the preceding in the brown thallus and in the lighter-coloured perithecia. The spores sometimes become distinctly 2-celled, suggesting affinity with the genus *Thelidium*, but in many specimens they remain constantly simple, and on that account it has been retained among the *Verrucariæ*.

Hab. On calcareous rocks, mortar of old walls, &c.—*Distr.* Rare in the Channel Islands, S. and N. England, N. Wales, Central Scotland, and S.W. Ireland.—*B. M.* Boulay Bay and Trinity, Jersey; Rustington, Sussex; Eaton, Berks; near Oswestry and Llanymynech, Shropshire; near Yarmouth; Dent, Yorkshire; near Stanhope, Durham; Levens, Westmorland; Westport, Mayo.

Thallus membranaceous, continuous, smooth.

35. **V. maculiformis** Krempelh. in Flora xli. 303 (1858).—Thallus very thin, olive-brown or blackish, forming small spots on the stone, which are often confluent. Perithecia small, semi-immersed, subglobose, becoming slightly depressed round the minute ostiole, black and shining; perithecial wall dimidiate; spores ellipsoid, 14–24 μ long, 6–10 μ thick.

Distinguished by the thin olivaceous thallus and the numerous shining black perithecia.

Hab. On calcareous rocks, flints, &c.—*Distr.* Rare in S., Central and N. England.—*B. M.* Near Cirencester, Gloucestershire; Norton near Worcester; below Cader Idris, Merioneth; near Ayton, Cleveland, Yorkshire; Hartlepool, Durham.

36. **V. mutabilis** Borr. ex Leight. Angioc. Lich. 55. t. 24, fig. 3 (1851) (excl. syn.).—Thallus dark-brown, like an oily stain, thin, filmy, membranaceous, continuous, smooth, subdeterminate or effuse, often nearly evanescent. Perithecia brownish-black, minute, scattered, prominent, hemispherical, sometimes polished and shining, internally pale; perithecial wall dimidiate; spores oblong, small, 8–14 μ long, 5–7 μ thick.—Mudd Man. 293 (excl. syn.); Leight. Lich. Fl. 418; ed. 3, 448.

Has been confused with other forms on account of the variable thallus. The thallus is thin and almost evanescent in the British Museum specimens.

Hab. On rocks, stones and pebbles.—*B. M.* Minehead, Somerset; Mayfield, Sussex.

Thallus tartareous, thin; perithecia not forming pits in the rocks.

37. **V. Dufourii** DC. Fl. Fr. ii. 318 (1805).—Thallus whitish or brownish-grey, tartareous, thin, continuous, smooth, determinate, sometimes with a black line at the edge. Perithecia rather large, numerous, prominent, hemispherical, depressed round the ostiole; perithecial wall dimidiate; spores ellipsoid, 15–22 μ long, 6–10 μ thick, or rather larger, hymenial gelatine wine-red with iodine.—Leight. Angioc. Lich. 76 & Lich. Fl. 415; ed. 3, 446; Mudd Man. 290; Cromb. Lich. Brit. 113. *V. concinna* Borr. in Engl. Bot. Suppl. t. 2623, f. 1 (1830); Winch Fl. North. & Durh. 86; Tayl. in Mackay Fl. Hib. ii. 90; Hook. in Sm. Engl. Fl. v. 152; Leight. Angioc. Lich. 50 & 76, t. 22, fig. 3.

Characterized by the almost superficial umbilicate perithecia.

Hab. On calcareous rocks.—*Distr.* Throughout the British Isles, but not common.—*B. M.* Torquay, Devon; Cheddar Cliffs, Somerset; Minchinhampton, Gloucestershire; Buxton, Derbyshire; Aberdovey, Merioneth; Minera near Wrexham, Denbighshire; Whitbarrow, Cuns-
wick Scar, Mallerstang, and Levens, Westmorland; Lamplugh, Cumber-
land; I. of Lismore, Argyll; Middleton, near Cork; Dunkerron, Kerry;
Glenarm, Antrim.

38. *V. malhamensis* Nyl. ex Shackleton & Hebden in Naturalist, 1892, 17.—Thallus whitish-grey, thin, continuous. Perithecia small black, prominent, impressed; spores oblong, 14–16 μ long, 5–6 μ thick.

According to Nylander (*l. c.*) similar in appearance to the preceding with affinities with *Verrucaria pulicaris* Mass. (*V. cyanea* var. *pulicaris* A. Zahlbr. Catal. Lich. Univ. 51 (1922)).

Hab. Damp shady rocks near the ground.—*B. M.* Malham, Yorkshire.

39. *V. cyanea* Massal. Mem. Lich. 144 (1853).—Thallus tartareous-farinose, thin, glaucous-grey or brownish-grey, continuous, irregularly traversed and limited by rather wide brown or blackish lines. Perithecia minute, semi-immersed in the thallus, hemispherical; perithecial wall dimidiate; spores ellipsoid, small, 12–14 μ long, 6 μ thick.—*V. limitata* Krempelh. ex Massal. Sched. Crit. vi. 123 (1856); Shackleton & Hebden in Naturalist, 1892, 17.

Differing in colour and form of the thallus from other species with limited thallus and from *V. muralis*, to which it is allied in the character of the perithecia, and by the much smaller spores.

Hab. On limestone and other rocks.—*Distr.* Rare in N. England.—*B. M.* Malham, Yorkshire; Hartlepool, Durham.

40. *V. muralis* Ach. Meth. 115 (1803).—Thallus effuse, white or greyish, tartareous, pulverulent, thin, sometimes faintly cracked-areolate, often evanescent. Perithecia black, hemispherical, small, semi-immersed; perithecial wall dimidiate, thick, somewhat spreading at the base, with a thin brown wall below the base; spores ellipsoid, 17–25 μ long, 10–12 μ thick or 21–30 $\mu \times$ 12–17 μ , sometimes slightly smaller.—Winch Bot. Guide ii. 44 (1807); Hook. in Sm. Engl. Fl. v. 154 pro parte? Tayl. in Mackay Fl. Hib. ii. 91 pro parte? *V. patula* Leight. Angioc. Lich. 61, t. 26, fig. 1 (1851). *V. rupestris* subsp. *muralis* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 32 (1858); Cromb. Lich. Brit. 114. Var. *muralis* Mudd Man. 292 (1861); Leight. Lich. Fl. 426; ed. 3, 456.

The perithecia though slightly immersed in the thallus are superficial on the substratum, and do not leave pits. Specimens are occasionally found with smaller spores, 15 μ long, 7 μ thick. It has been classified by Zahlbruckner Catal. Lich. Univ. 86 (1922) under *V. rupestris*.

Hab. On brick walls, stones, mortar, &c.—*Distr.* Not uncommon in the Channel Islands and throughout England, rare in Scotland and Ireland.—*B. M.* Noirmont, Jersey; Luccomb, I. of Wight; Worthing and Downs, Sussex; Minchinhampton, Gloucestershire; Much Wenlock and Buildwas, Shropshire; Norton and Malvern, Worcestershire; Carlton Bank and Ayton, Cleveland, Yorkshire; Heversham and Lowther Park, Westmorland; Penmanshiels, Berwickshire; Isl. of Lismore, Argyll; Craig Tulloch and near Perth, Perthshire; near Aberdeen; near Cork; Ballynahinch near Kylemore, Connemara, Galway; Clare Isl., Mayo.

Var. *submuralis* Oliv. Exp. Syst. Lich. Ouest France 292 (1903).—Thallus as in the species. Perithecia entire or darker beneath; spores 19–23 μ long, 9–11 μ thick.—*Verrucaria submuralis* Nyl. in Flora Iviii. 14 (1875).

The specimen in the British Museum determined by Nylander has smaller spores than the above, and corresponds more nearly to *V. submuralis* f. *minor* B. de Lesd. Lich. Dunk. 246 (1910).

Hab. On rocks, bricks, &c.—*B. M.* Isl. of Lismore, Argyll.

Thallus tartareous, thin; perithecia forming pits in the rocks.

41. *V. rupestris* Schrad. Spicil. 109 (1794) pro parte; DC. Fl. Franc. ii. 317 (1805).—Thallus white or greyish-white, greenish or brownish, effuse, or sometimes in orbicular patches, thin, tartareous, pulverulent. Perithecia moderate in size, black, numerous, hemispherical, semi-immersed, leaving shallow pits in the stone; perithecial wall dimidiate, a thin brown wall passing under the base; spores ellipsoid-oblong, sometimes slightly brownish, 18–30 μ long, 8–13 μ thick.—Hook. in Sm. Engl. Fl. v. 152; Tayl. in Mackay Fl. Hib. ii. 90; Mudd Man. 291; Cromb. Lich. Brit. 114 (excl. var. & subsp.); Leight. Lich. Fl. 425; ed. 3, 456 (excl. vars.).

Ersicc. Johns. n. 519.

Nearly allied to the following species but with smaller dimidiate perithecia, which are somewhat prominent and leave very shallow pits when they drop out at maturity.

Hab. On stones and rocks, chiefly calcareous.—*Distr.* Frequent throughout the British Islands.—*B. M.* Torquay, Devonshire; Rottingdean and Newhaven, Sussex; Rodmarton and Sapperton, Gloucestershire; Twyross, Leicestershire; Trefriw, Carnarvonshire; Arnside, Westmorland; Whitehaven, Cumberland; Appin, Argyll; Middleton, Cork.

Var. *runderum* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 30 (1858).—Thallus rather thicker, white or greyish-white, cracked-areolate, or evanescent. Perithecia semi-immersed, otherwise as in the species.—*Verrucaria runderum* DC. Fl. Franc. ii. 318 (1805); Salw. in Trans. Bot. Soc. Edinb. vii. 555 (1863).

Hab. On calcareous rocks and walls. Recorded as British by Salwey but without locality.—*B. M.* Alderney (a somewhat imperfect specimen in the Larbalestier herbarium).

Var. *subalbicans* Mudd Man. 292 (1861).—Thallus greyish-white, thin, pulverulent. Perithecia slightly larger than in the species and with a more developed wall below the base, leaving scarcely perceptible pits in the substratum; spores 17–20 μ long, 11 μ thick.—Leight. Lich. Fl. 426; ed. 3, 457. *V. subalbicans* Leight. Angioc. Lich. 56, t. 25, fig. 1 (1851).

Exsicc. Leight. no. 200.

Difficult to distinguish from *V. integra* except in the constantly smaller spores.

Hab. On mortar, plastered walls, &c.—*Distr.* Rather rare in S. and N. England and N.W. Wales.—*B. M.* Near Ayton, Cleveland, Yorkshire; Bangor, Carnarvonshire; Shap, Westmorland.

42. *V. integra* Carroll in Journ. Bot. iv. 25 (1866).—Thallus white or greyish-white, suberustaceous, tartareous, subfarinose. Perithecia black, numerous, moderate in size, semi-immersed, leaving shallow pits in the rock, hemispherical, depressed above; perithecial wall thick, black, somewhat spreading at the base, with a thinner black wall beneath the base; spores ellipsoid-oblong, rather large, 23–32 μ long, 10–20 μ thick or larger and sometimes brownish.—Leight. Lich. Fl. 426; ed. 3, 457. *V. rupestris* var. *integra* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 429 (1856); subsp. *integra* Nyl. Lich. Scand. 276 (1861); Cromb. Lich. Brit. 114. *Sagedia ampullacea* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. 39, t. 4, fig. 11 (1854)?

Differs from *V. rupestris* in the entire perithecial wall and the somewhat large perithecia and spores. It is classified by Zahlbruckner under *V. dolomitica* (Catal. Lich. Univ. 34 (1922)).

Hab. On rocks, mostly calcareous, mortar, &c.—*Distr.* Rather rare in S., Central and N. England, among the Scottish Grampians and in S. Ireland.—*B. M.* Downs, Sussex; Holmwood, Surrey; near Bisley, Sapperton and St. Vincent Rocks, Bristol, Gloucestershire; Ayton, Cleveland, Yorkshire; Cunswick Scar, Arnside, and Heversham, Westmorland; near Perth and Craig Tulloch, Perthshire; Isl. of Lismore, Argyll; near Cork, Dunkerron, Kerry.

Form *terrestris* Watson in Journ. Bot. lv. 315 (1917).—Thallus greenish. Perithecia forming deeper pits.

Hab. On decomposed calcareous rock.—*B. M.* Merridge near Bridgwater, Somerset.

43. *V. dolomitica* Massal. Gen. Lich. 22 (1854).—Thallus thin, tartareous-farinose, continuous, greyish- or greenish-white, often with a tinge of rose-colour, usually limited by a dark line. Perithecia semi-immersed in pits, the apex protruding, papillate or truncate; perithecial wall entire; spores rather large, ellipsoid-ovoid, 24–36 μ long, 10–15 μ thick.—*Amphoridium dolomiticum* Massal. Symm. Lich. 80 (1855).

Differs from *V. integra* in the more developed limited thallus and the deeper pits in which the perithecia are immersed.

Hab. On calcareous and other rocks.—*Distr.* Rare in E. and middle England, Central Scotland and S. Ireland. — *B. M.* Suffolk; Derbyshire; near Bath; Hartlepool, Durham; near Edinburgh; Dunkerron, Kerry.

44. *V. marmorea* Arn. in *Flora* lxviii. 73 (1885); A. Zahlbr. in Engler & Prantl *Nat. Pflanzenf.* i. 1*, 55 (1903).—Thallus effuse, tartareous, thinnish, continuous, smooth, pale-rose or rose-purple tinged with red. Perithecia moderate in size, black, immersed, then slightly emergent, leaving pits in the stone: spores ovoid, 22–24 μ long, 12–13 μ thick.—*V. purpurascens* Hoffm. *Pl. Lich.* i. 74, t. 15, fig. 1 (1790). *V. rupestris* var. *purpurascens* Schær. *Enum.* 217 (1850); Mudd *Man.* 292; Croub. *Lich. Brit.* 114. *V. calciseda* var. *purpurascens* Leight. *Lich. Fl.* 428; ed. 3, 458. *Lichen marmoreus* Scop. *Carn.* ed. 2, ii. 367 (1772) (non With. & non Engl. Bot.).

A doubtful British species. Two specimens have been recorded: one collected by Mudd at Castle Eden, Durham, without spores, with a cracked-areolate thallus and no sign of pitting, probably a form of *V. viridula*; the other collected by Parfitt at Exeter I have not seen.

Hab. On calcareous rocks.—*Distr.* S.W. and N. England?

45. *V. parva* Deakin in *Ann. Mag. Nat. Hist.* ser. 2, xiii. 33, t. 1, fig. 2 (1854).—Thallus somewhat tartareous, thin, ashy-grey, continuous, effuse. Perithecia minute, globose, black, semi-immersed and leaving shallow pits in the rock: perithecial wall entire; paraphyses mucilaginous, disappearing; asci oblong-elliptical about 45 μ long, 17 μ thick; spores 8 in the ascus, ellipsoid, blunt at the ends, colourless, small, 12–17 μ long, 5–7 μ thick.

Deakin has described and figured the spores as 1-septate, but an examination of his specimen shows them to be simple with sometimes disorganized contents that might simulate septation.

Hab. On limestone rocks. — *B. M.* Torquay, Devonshire; Ashton Court, Somerset (W. Watson).

46. *V. sphinctrina* Nyl. *Lich. Paris.* 121 (1896).—Thallus effuse, thin, tartareous, subpulverulent, white or greyish-white, often evanescent. Perithecia small, numerous, deeply immersed in the thallus and the rock beneath, leaving pits in the stone, the upper part more or less regularly divided by 4 or 5 fissures; perithecial wall dimidiate; spores ellipsoid, 15–21 μ long, 8–10 μ thick.—*V. calciseda* DC. *Fl. Franc.* ii. 317 (1805) pro parte; Mudd *Man.* 292; Croub. *Lich. Brit.* 115; Leight. *Lich. Fl.* 427; ed. 3, 458 (excl. var. *purpurascens*). *V. immersa* Hoffm. *Pl. Lich.* i. 58, t. 12, figs. 2–4 (1790)? Tayl. in Mackay *Fl. Hib.* ii. 90. *Limboria sphinctrina* Duf. ex Fries *Lich. Eur.* 456 (1831).

Exsicc. Leight. n. 30 (as *V. immersa*); Mudd n. 280.

Distinguished by the fissured apex of the perithecia, on account of which it has been placed by some authors in a separate genus, *Limboria*.

The distinguishing character of the species—the fissured apex of the perithecium—has been associated with DeCandolle's *V. calciseda* by British authors with the exception of Taylor. The fissuring was first distinctly indicated in Fries Lich. Eur. as a character of the new genus and species *Limboria sphinctrina*. The specific name *sphinctrina* has now been generally adopted. *V. calciseda* has been retained as a species emended by Steiner (Verh. K. K. Zool.-bot. Gesell. Wien. lxi. 36 (1911)), with a thalline structure similar to *V. sphinctrina* but the perithecia without fissures, and classified by some authors as a variety of *V. rupestris*.

Hab. On calcareous rocks.—*Distr.* Rather common in S. and N. England, rare in Scotland, S. and S.W. Ireland.—*B. M.* Torquay, Devonshire; Landslip, I. of Wight; near Cheltenham, Gloucestershire; Llanymynech, Shropshire; Laleston near Bridge-end, Glamorganshire; Great Orme's Head, Carnarvonshire; Buxton, Derbyshire; Bilsdale, Yorkshire; Levens and Cunswick Scar, Westmorland; Morrone, Braemar, Aberdeenshire; near Cork; Dunkerron and Killarney, Kerry.

Doubtful or parasitic species.

47. **V. Harrimanni** Ach. Lich. Univ. 284 (1810).—Thallus effuse, tartareous, smooth, mouse-coloured, determinate. Perithecia minute, black, immersed in the substratum, globose, dimidiate, depressed round the emerging ostiole; spores ovoid, very minute.—Hook. in Sm. Engl. Fl. v. 153; Leight. Angioc. Lich. 63, t. 19, fig. 4; Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. 38, t. 3, fig. 9 (1854). *Lichen Harrimanni* Sm. Engl. Bot. t. 2539 (1814). *Lithocia Harrimanni* S. F. Gray Nat. Arr. i. 497 (1821). Specimen not seen.

A doubtful species. Considered by Hepp (Flecht. Eur. n. 691) to be synonymous with *V. hiascens*, the spermogoniferous form of *V. Hochstetteri*, which has not been recorded for the British Isles, though probably to be found. The minute spores indicate the spermogonial character of the perithecia, though Deakin (*l. c.*) states that asci are present.

Hab. On hard grey calcareous rocks (Torquay, Devonshire; Durham).

48. **V. pulposa** Leight. Lich. Fl. 427 (1871).—Thallus chroolepoid or evanescent. Perithecia blackish, subglobose, pulpose, polished, prominent; epithecium indistinct; perithecial wall dimidiate, blackish; spores numerous, fuscous, oblong or irregularly globose, simple; paraphyses very short, crowded; hymenial gelatine untinged with iodine.—Leight. Lich. Fl. ed. 3, 457. Specimen not seen.

An aberrant and imperfectly described species, probably a fungus.

Hab. On old rails near Shrewsbury, Shropshire.

49. **V. elachistophora** Nyl. in Flora lxi. 246 (1878).—Thallus white, unequal, cracked (perhaps not proper). Perithecia

(parasitic?) black, partly emergent, slightly depressed above; perithecial wall black, entire; spores 8 in the ascus, oblong-ellipsoid, colourless, simple (or sometimes spuriously 1-septate), 7–8 μ long, 3.5 μ thick; paraphyses moderate; hymenial gelatine not tinged with iodine.—Cromb. in Grevillea vii. 98; Leight. Lich. Fl. ed. 3, 454. Specimen not seen.

The presence of paraphyses would exclude this species from the genus, but it requires further investigation.

Hab. On quartzose rocks. Kylemore, Connemara, Galway, the only locality.

50. **V. conturmatula** Nyl. in Flora lxii. 222 (1879).—Thallus indicated by greyish spots. Perithecia small, black, depressed, subconfluent; perithecial wall dimidiate; spores 8 in the ascus, ellipsoid or ovoid-ellipsoid (sometimes obsoletely 1-septate), 11–14 μ long, 5–6 μ thick; hymenial gelatine wine-red with iodine.—Cromb. in Grevillea viii. 29 (1879).

Nylander considers that the species is possibly parasitic. The specimen in the herbarium of the British Museum is too small and scanty for examination. Larbalestier states that only two small specimens were met with.

Hab. On quartzose rocks in a stream associated with *Lecanora lacustris*.—B. M. Near Glencorbet, Connemara, Galway.

Imperfect Species.

V. niveoatra Borr. in Engl. Bot. Suppl. t. 2637, fig. 1 (1830); Hook. in Sm. Engl. Fl. v. 151; and **V. mollis** Tayl. in Mackay Fl. Hib. ii. 97 (1836); recorded respectively as *Pyrenotheca niveoatra* Leight. Angioc. Lich. 67, t. 29, fig. 1, and *P. mollis* Leight. l. c. t. 29, fig. 2, are the spermogonial condition of other lichens. *V. niveoatra* has been determined by Nylander (Lich. Env. Paris, 108 (1896)), as the spermogonial state of *Opegrapha cinerea*, a species not otherwise recorded in the British Isles. It has arcuate spermatia measuring 12–16 μ long, 1 μ thick, and in this respect alone differs from *O. vulgata*, in which the spermatia are 14–16 μ long, .5 μ thick (*vide* Nyl. l. c.); the two species are probably identical. A specimen of *V. mollis* from Craig Mt., Kerry, has been determined by Nylander as the spermogonial state of an *Opegrapha*.

V. lithina Tayl. in Mackay Fl. Hib. ii. 92 (1836) (non Ach.) on rocks from Derriquin, Kerry, has been determined as *Pyrenotheca lithina* Leight. Angioc. Lich. 68, t. 29, fig. 3. *P. lutea* Leight. l. c. t. 29, fig. 4, collected on trees at Gopsal, Leicestershire, and *P. sulphurea* Leight. tom. cit. 69, t. 29, fig. 5, on sandstone rocks, Niton, I. of Wight, are also, judging from the descriptions and figures, spermogonial states of lichens not determined. For other "*Verrucariæ*" see "Microfungi recorded as British Lichens."

110. **SARCOPYRENIA** Nyl. in Maine et Loire Mém. Soc. Acad. iv. 69 (1858) (Pl. 44).

Thallus crustaceous. Algal cells Protococcaceæ. Perithecia simple, scattered, with a black peridium, opening by an ostiole; paraphyses slender; paraphyses disappearing; asci elongate-clavate, soon disappearing, 8-spored; spores one-celled, colourless, cylindrical-vermiform, slightly flexuose or twisted in the middle, the ends clavately thickened.

A monotypic genus recorded first from Constantine in Algiers, then from Switzerland and from S.W. Germany. It is distinguished by the long vermiform spores. We are indebted to Rev. W. Johnson for this interesting lichen collected by him in November, 1880; it escaped recognition until recently, and was sent to the British Museum for determination in December, 1917.

S. gibba Nyl. l. c.—Thallus effuse, thin, yellowish-grey, mostly obsolete or immersed in the rock. Perithecia black, scattered or congregate, .5 mm. in diam. or less, hemispherical, with a minute papillate ostiole, or depressed and *Lecidea*-like, the outer peridium thickish, dimidiate but incurved at the base, the inner wall dark-brown; asci cylindrical fusiform, about 70 μ long, 10 μ thick, 8-spored; spores 30–40 μ long, 3–3.5 μ thick.—*Verrucaria gibba* Nyl. in Mém. Soc. Sci. Nat. Cherb. ii. 342 (1854).

Exsicc. Johns. n. 516.

In the specimen on sandstone from St. Bees the thallus is extremely scanty. Johnson, however, finds that it is "reddish or whitish-brown, thin, furfuraceous, occasionally cracked-areolate and mostly evanescent; hypothallus white or whitish." The spores seem to be almost flat at the centre, where they are generally half-twisted over.

Hab. On arenaceous rocks.—*B. M.* St. Bees, Cumberland.

111. **THELIDIUM** Massal. Framm. Lich. 15 (1855); Mudd Man. 294 (Pl. 45).

Thallus variously crustaceous, uniform, sometimes wanting. Algal cells Protococcaceæ. Perithecia black, simple, superficial or immersed; paraphyses mucilaginous, soon disappearing; asci usually somewhat large and saccate, 8-spored; spores ellipsoid or ovoid, usually rather large, 2–4-celled, colourless or sometimes brownish.

Spores 1-septate.

1. **Th. pyrenophorum** Koerb. Syst. Germ. 353 (1855) pro parte, emend. (non Massal.).—Thallus greyish-white or -brown, effuse, thin, slightly cracked when old, sometimes almost obsolete. Perithecia rather large, semi-immersed or superficial, usually depressed round the ostiole; perithecial wall thick, dimidiate, the inner wall brownish; paraphyses disappearing; spores broadly oblong, colourless or pale-yellowish, 1-septate, 20–32 μ long, 10–18 μ thick.—*Th. Borreri* Mudd Man. 296 (1861). *Verru-*

caria pyrenophora Ach. Lich. Univ. 285 (1810); *V. Dufourii* Borr. in Engl. Bot. Suppl. t. 2791 (1831) (non DC.); Tayl. in Mackay Fl. Hib. ii. 92; Leight. Angioc. Lich. 51, t. 22, fig. 4. *V. Borreri* Leight. *tom. cit.* 76 (1851) & Lich. Fl. 429; ed. 3, 459; Cromb. Lich. Brit. 112 pro parte.

From the similarity in the outward formation of thallus and especially of the perithecia when well developed apt to be confused with *Th. papulare* and *Verrucaria Dufourii*.

Hab. On calcareous rocks.—*Distr.* Rare in Scottish Grampians and W. Ireland.—*B. M.* Mae Ptarmigan, Breadalbane and Ben Lawers, Perthshire; Clifden, Connemara, Galway; Achill Island, Mayo.

2. *Th. subrimulatum* A. Zahlbr. Catal. Lich. Univ. i. 133 (1922).—Thallus pale cinereous, thinly rimulose. Perithecia minute, prominent, perithecial wall entire or subentire, black, beneath slightly brownish; spores ellipsoid, 1-septate, 23–34 μ long, 11–16 μ thick.—*Thelidium explicatum* Wheld. & Wils. in Journ. Bot. liii. suppl. 70 (1915); A. L. Sm. Monogr. Brit. Lich. i. 482 (1918). *Verrucaria subrimulata* Nyl. in Flora lvii. 316 (1874). *V. explicata* Stirton in Scott. Nat. v. 220 (1880).

Stirton himself (MS.) suggested that *Verrucaria explicata* was similar to *V. subrimulata* Nyl. and gave that name to one of the specimens. The published descriptions leave little doubt of their identity, though Stirton has noted that the ascus is 4- to 8-spored and that the spores are slightly wider at one end (*gibbosa*) a character not well marked. Found previously in West France and in the Pyrenees.

Hab. On schistose rocks.—*B. M.* Near the summit of Ben Lawers, Perthshire.

3. *Th. mesotropum* A. L. Sm.—Thallus pale, thin, unequal. Perithecia black, somewhat turgid, convex; perithecial wall dimidiate; spores colourless, ovoid or ovoid-oblong, small, 1-septate, 12–17 μ long, 5–6 μ thick; hymenial gelatine wine-red with iodine.—Wheld. & Trav. in Journ. Linn. Soc. xliii. 132 (1915). *Verrucaria mesotropa* Nyl. in Flora lxix. 419 (1866); Leight. in Ann. Mag. Hist. ser. 3, xix. 408 (1867) & Lich. Fl. 431; ed. 3, 459; Cromb. Lich. Brit. 115.

Hab. On subalpine rocks.—*Distr.* Rare in hilly districts in W. England and Wales.—*B. M.* Llanymynech Hill, Shropshire (recorded also by Wheldon and Travis (*l. c.*) in S. Lancashire).

4. *Th. immersum* Mudd Man. 295, t. 5, fig. 123 (1861).—Thallus white, grey-ashy-white or pale-dirty-yellow, thin, tartareous and somewhat farinose, sometimes determinate. Perithecia black, deeply immersed and leaving pits in the rock, depressed round the ostiole; perithecial wall thick above, thinner round the base; spores colourless, ellipsoid, constantly 1-septate, rather large, 25–38 μ long, 12–17 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria immersa* Leight. Angioc. Lich. 57, t. 25, fig. 2 (1851) (excl. syn.) & Lich. Fl. 436; ed. 3, 460.

Exsicc. Mudd n. 283.

Apt to be confused with *Thelidium Auruntii* on account of the thin light-coloured thallus and the pitting of the substratum. The spore characters recorded are both smaller and larger than the size given by Leighton; but the 2-celled spores and the pitted substratum are characteristic of all the forms. Watson (in litt.) reports this species as frequent on carboniferous limestone.

Hab. On calcareous rocks.—*Distr.* In upland regions.—*B. M.* Hailey Wood and Tetbury near Cirencester, Gloucestershire; Bwlebgwyn, near Wrexham, Denbighshire; Bilsdale, Yorkshire; Heversham Head, Westmorland; Morrone, Braemar, Aberdeenshire; Dunkerron, Kerry; White Park Bay, Antrim.

5. *Th. viride* A. Zahlbr. Catal. Lich. Univ. i. 135 (1922).—Thallus crustaceous, thin, greyish-green, brighter green when moist and sometimes gelatinous, effuse, with a whitish hypothallus. Perithecia small, scattered, black, hemispherical, prominent, at length depressed, the ostiole poriform; perithecial wall dimidiate; paraphyses mucilaginous, disappearing; asci ellipsoid-ovoid, about $70\ \mu$ long, $25\text{--}30\ \mu$ thick; spores 8 in the ascus, ellipsoid, rather blunt at the ends, with colourless or brownish granular contents, 1-septate, $22\text{--}33\ \mu$ long, $9\text{--}14\ \mu$ thick.—*Th. Nylanderii* Lönnr. in Oefvers. Kgl.-Vet.-Akad. Förh. Stockholm, 1858, 284 (1859); A. L. Sm. Monogr. ii. 298 (1911). *Verrucaria viridis* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. 36, t. 3, f. 7, 1854; *Sagedia Nylanderii* Hepp Flecht. Eur. n. 440 (1857).

Not always easy to distinguish from *Th. cataractarum*, but the habitat is drier, and the spores more definitely 1-septate.

Hab. On sandstone or oolite rocks.—*B. M.* Torquay, Devon; Mickleham, Surrey; West Hatch, Somerset; Cowcombe Wood, Chalford, Gloucestershire; Sligo.

6. *Th. terrestre* Wats. in Journ. Bot. lv. 107, fig. B. (1917).—Thallus thin, effuse, crustaceous or leprose, green or darker. Perithecia minute, black, scattered, semi-immersed, at length more or less sessile; perithecial wall dimidiate, the outer wall dark-brown, inner pale-brown, ostiole minute, not depressed; ostiolar filaments few or none; paraphyses disappearing or absent; asci clavate; spores colourless or greyish, granular, ellipsoid, one end usually narrower, 1-septate, slightly constricted in the middle, $16\text{--}28\ \mu$ long, $7\text{--}11\ \mu$ thick.

Allied to *Th. viride*. Watson considers it to be near to *Th. Zwackhii* Massal. a saxicolous and soil species of Central and S. Europe, the spores of which are larger and 1-3-septate.

Hab. On soil of hedge-bank among mosses.—*B. M.* Cheddon Fitzpaine, Somerset.

Spores mostly 3-septate.

7. *Th. cataractarum* Lönnr. in Oefvers Kgl. Vet.-Akad. Stockholm, 1858, 284 (1859).—Thallus greyish-green, effuse,

thin, somewhat gelatinous when moist, subleprose when dry, sometimes evanescent. Perithecia small, semi-immersed or nearly sessile, subglobose, soft when moist; perithecial wall dimidiate, black; paraphyses disappearing; spores ellipsoid-oblong, 1-3-septate, colourless or pale-brownish, 21-32 μ long or longer, 10-15 μ thick.—Mudd Man. 294 (1861). *Sagedia cataractarum* Hepp Flecht. Eur. n. 442 (1857). *Verrucaria cataractarum* Cromb. Lich. Brit. 112 (1870) (excl. syn. *V. margacea* Leight.); Leight. Lich. Fl. 429; ed. 3, 459.

Exsicc. Mudd n. 281; Leight. n. 319 (as *Verrucaria margacea*, var.).

The spores in this lichen vary from 2- to 4-celled, but it differs from *Th. viride* in the thin gelatinous thallus due to the moist or wet locality. In some of the specimens examined, the spores seem to be of arrested development, as in Leighton's n. 319, in which they are 2-celled and shrivelled. The asci in Mudd's n. 281 measure about 55 $\mu \times 25 \mu$.

Hab. On rocks and stones in moist places or in streams.—*Distr.* Rare in S. and N. England, Scotland and in E., S. and W. Ireland.—*B. M.* Near Ayton, Cleveland, Yorkshire; near Perth; Rosscarbery, Cork; Balscadden, Howth, near Dublin.

8. *Th. papulare* Arn. in Flora lxviii. 147 (1885).—Thallus greyish or brownish, crustaceous, rather thick and cracked or thinner, furfuraceous and almost continuous, sometimes almost obsolete. Perithecia large, black, semi-immersed or superficial, usually depressed round the ostiole; perithecial wall dimidiate; paraphyses disappearing; spores ellipsoid, 3-septate, very large, colourless, 35-50 μ long, 15-20 μ thick.—*Th. pyrenophorum* Koerb. Syst. Lich. Germ. 353 (1856) pro parte; Mudd Man. 294. *Verrucaria papularis* Fr. Lich. Eur. 434 (1831) *vide* Arnold. *V. Sprucei* Ch. Bab. ex Leight. Angioc. Lich. 54, t. 23, figs. 4-6 (1851). *V. pyrenophora* Leight. *tom. cit.* 76 (non Ach.) & Lich. Fl. 442; ed. 3, 474; Cromb. Lich. Brit. 112 pro parte.

Exsicc. Johns. n. 439; Leight. n. 139; Larb. Lich. Hb. n. 240.

Often confused with *Th. pyrenophorum*, which it resembles in the outward appearance of thallus and perithecia, but distinguished by the larger 3-septate spores. Leighton's note in Angioc. Lich. 76, in which he states that he had examined an authentic specimen of *V. pyrenophora* Ach., is at variance with Nylander's description of that species (Maine et Loire Mém. Soc. Acad. iv. 26 (1858)), and with the Acharian specimens at the Linnean Society.

Hab. On rocks in damp upland regions.—*Distr.* Rare throughout England, Scotland and Ireland, not recorded from the Channel Islands.—*B. M.* Whitecliffe Rocks near Ludlow, Craigforda and Llanymynech, Shropshire; Minera, near Wrexham, Denbighshire; Egremont and Lamplugh, Cumberland; near Perth and Craig Calliach, Perthshire; Rosscarbery Rocks, Cork; Ballaghbeama Gap, Kerry; Doughruagh Mt. and Kylemore, Connemara, Galway; Armagh.

9. *Th. microcarpum* A. L. Sm.—Thallus whitish, slightly greenish or greyish, farinose or evanescent. Perithecia minute,

black, solitary or congregate, hemispherical, sessile, opening by a pore, not leaving pits; perithecial wall dimidiate; paraphyses none; spores colourless, oblong-ellipsoid, 3-septate, 26–32 μ long, 12–14 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria microcarpa* Davies ex Leight. Lich. Fl. 442 (1871); ed. 3, 474.

Hab. On chalk.—*Distr.* Rare in S. England.—*B. M.* Beeding Downs, Plumpton Downs and Glynde, Sussex. Recorded also by Wheldon and Travis (Journ. Linn. Soc., xliii. 132 (1915)) on pieces of mortar in S. Lancashire.

10. **Th. Auruntii** Krempelh. in Denkschr. K. Bayer. Bot. Gesellsch. iv. Abt. 2, 248 (1861) *vide* A. Zahlbr. Catal. Lich. Univ. 114 (1922).—Thallus greyish-white, tartareous, thin, smooth or somewhat farinose, continuous. Perithecia black, hemispherical-globose, with a large ostiole, deeply immersed, leaving pits in the rock; perithecial wall entire; paraphyses disappearing; spores ellipsoid-oblong, colourless, 3-septate, sometimes constricted at the septa, 35–53 μ long, 12–21 μ thick, sometimes smaller.—Jones in Proc. Nat. Hist. Soc. Dublin, iv. 137 (1865). *Th. incavatum* Mudd Man. 295, t. 5, f. 122 (1861). *Verrucaria Auruntii* Massal. Gen. Lich. 22 (1854) and Symm. Lich. 77 (1865); Cromb. Lich. Brit. 112 (1870). *V. pyrenophora* var. *incavata* Nyl. ex Mudd *l. c.*; Cromb. Lich. Brit. 112. *Verrucaria incavata* Leight. Lich. Fl. 445 (1871); ed. 3, 476.

Exsicc. Mudd n. 282.

Distinguished from *Th. papulare* and *Th. microcarpum* by the pit-forming perithecia. The spores in the specimens examined are smaller than the measurements as above given by Leighton *l. c.*, varying in size from 35–40 μ long and 12–15 μ thick.

Hab. On calcareous rocks.—*Distr.* Rare in N. England, Wales and W. Ireland.—*B. M.* Goblin Combe, near Yatton, Somerset; Mickleham, Surrey; near Cheltenham, Gloucestershire; Buxton, Derbyshire; Bilsdale, Yorkshire; Teesdale, Durham; Cunswick Scar and Heversham Head, Westmorland; near Perth.

Doubtful or parasitic.

11. **Th. sparsulum** A. L. Sm.—Thallus indistinct. Perithecia scattered, minute, subglobose; perithecial wall entire; asci somewhat saccate; paraphyses mucilaginous, disappearing; spores colourless, ellipsoid, becoming 3-septate, 23–27 μ long, 10–13 μ thick.—*Verrucarina sparsula* Nyl. in Flora lx. 231 (1877); Cromb. in Grevillea vi. 20. *Verrucaria sparsula* Leight. Lich. Fl. ed. 3, 478 (1879).

Outwardly very like *Th. microcarpum*, and possibly an imperfect stage of that lichen. The extremely minute perithecia are scattered over the substratum either on the stone or on a thinly furfuraceous dark-brownish layer, a mixture of various algæ and brown fungal hyphæ. Nylander (*l. c.*) considered the blue-green algæ to be gonidimia and described the lichen under a new genus *Verrucarina* akin to *Pyreni-*

diacæ. The specimens in the British Museum are somewhat imperfectly developed; the connection is not clear between the perithecia and the gonidimia, and the spores are immature and simple or only 1-septate.

Hab. On chalk.—*Distr.* Rare in S. England.—*B. M.* Lewes, Sussex; Dorking and Reigate, Surrey.

12. *Th. superpositum* A. L. Sm.—Thallus none. Perithecia minute, almost superficial, black, depressed globose, with a poriform ostiole; perithecial wall entire; paraphyses mucilaginous, disappearing; ostiolar filaments (periphyses) distinct; asci obovate-ellipsoid; spores 8 in the ascus, colourless, ellipsoid-clavate, 1-septate, 17–19 μ long, 6–8 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria superposita* Nyl. in *Flora* xlviii. 357 (1865); Carroll in *Journ. Bot.* iv. 25 (1866); Croub. *Lich. Brit.* 115; Leight. *Lich. Fl.* 462; ed. 3, 494.

Classified by Saccardo as a fungus under the genus *Pharcidia* (Syll. Fung. xvii. 649 (1905)); Vouaux in *Bull. Soc. Mycol. Fr.* xxiii. 248 (1912). It is retained here as a doubtful "half-lichen."

Hab. Parasitic on *Polyblastia theleodes*.—*B. M.* Ben Lawers, Perthshire (the only locality).

112. **POLYBLASTIA** Massal. Ric. *Lich.* 147 (1852) pro parte; emend. Lönrr. in *Flora* xli. 630 (1858).—*Spharomphale* Reichenb. *Consp. Reg. Veg.* 20 (1828) pro parte; Mudd *Man.* 281 pro parte. (*Pl.* 46).

Thallus variously crustaceous, not corticated, sometimes developed within the substratum. Algal cells *Protococcacææ*. Perithecia simple, superficial or immersed in the thallus, sometimes embedded in the substratum and leaving pits; ostiole a simple pore; paraphyses mucilaginous, disappearing; asci broadly clavate, 1–8-spored; spores rather large, ellipsoid, muriform, colourless or dark-coloured. Stirton's species *Verrucaria addubitans* in *Scott. Nat.* v. 220 (1880) on decaying wood (*Polyblastia addubitans* Wheld. & Wilson in *Journ. Bot.* liii. 71 (1915)) is a fungus, *Pleospora* sp.

Thallus squamulose or subsquamulose.

1. *P. tristicula* Th. Fr. in *Nov. Act. Reg. Soc. Sci. Upsala* Vol. extraord. N. 8, 14, 1877.—Thallus of brown smooth globose or subsquamulose appressed scattered granules. Perithecia black, subglobose, moderate in size, with a punctiform, scarcely visible ostiole; perithecial wall entire, somewhat wrinkled; paraphyses wanting; spores usually 2 in the ascus, colourless, becoming brownish, muriform, large, 60–132 μ long, 21–51 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria tristicula* Nyl. in *Flora* xlviii. 356 (1865); Carroll in *Journ. Bot.* iv. 24 (1866); Croub. *Lich. Brit.* 110; Leight. *Lich. Fl.* 456; ed. 3, 488. *Agonimia tristicula* A. Zahlbr. in *Bot. Zeitschr.* lix. 350, 1909.

It has seemed advisable to retain this species under *Polyblastia*, though Zahlbruckner has made it the type of his new genus, *Agonimia*, and has classified it near to *Endocarpon*, to which he considers it to bear the same relation as *Polyblastia* to *Staurothele*.

Hab. On mosses usually in upland regions.—*B. M.* Trull, near Taunton, Somerset (W. Watson); Aviemore, Inverness-shire; Assynt, Sutherland (H. H. Knight).

Thallus crustaceous.

Spores colourless.

2. *P. intercedens* Lönnr. in Flora xli. 631 (1858).—Thallus greyish or dark-brownish, tartareous, thin, continuous or faintly cracked, effuse, or determined by a black line, sometimes obsolete. Perithecia moderate in size, black, prominent, immersed at the base, subhemispherical, usually somewhat depressed round the poriform ostiole; perithecial wall dimidiate; paraphyses none; spores 8 in the ascus, colourless, rarely pale-brownish, ellipsoid, muriform, the cells numerous, irregular, 24–42 μ long, 15–21 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria intercedens* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 137 (1857) and in Maine et Loire Mém. Soc. Acad. iv. 33 (1858); Carroll in Journ. Bot. iii. 292 (1865); Cromb. Lich. Brit. 114; Leight. Lich. Fl. 454; ed. 3, 487.

Very variable in appearance according to the form of development. In some specimens the perithecia are strongly umbilicate and are comparable with those of *Verrucaria Dufourii* or *Thelidium papulare*; in others the ostiole is scarcely visible.

Hab. On schistose, arenaceous and calcareous rocks.—*Distr.* Rare in mountainous regions in Scotland and N. England, but also recorded from S. England.—*B. M.* Buxton, Derbyshire; Ben Lawers, Perthshire.

3. *P. spurcella* A. L. Sm.—Very similar to the preceding, except for the thinner, obscurely smoky thallus; spores colourless, muriform, 22–25 μ long, 11–14 μ thick.—*Verrucaria spurcella* Nyl. ex Shackleton & Hebden in Naturalist. 1892, 17.

Hab. Limestone walls. *B. M.* Malham, Gordale, Yorkshire.

4. *P. fuscoargillacea* Anzi in Comm. Soc. Critt Ital. ii. 1, 26 (1864).—Thallus brownish- or whitish-grey, thin, effuse, minutely cracked-areolate, becoming farinose. Perithecia black, small, numerous, often crowded, sessile, hemispherical, the base only immersed, the ostiole poriform; perithecial wall dimidiate; paraphyses disappearing; spores 6 to 8 in the ascus, ellipsoid, colourless or faintly yellowish, muriform, 18–28 μ long, 11–16 μ thick; hymenial gelatine reddish with iodine.—*Verrucaria fuscoargillacea* Cromb. in Journ. Bot. ix. 179 (1871); Leight. Lich. Fl. 455; ed. 3, 487.

Hab. On rocks, mostly calcareous.—*Distr.* Rare in W. England, N. Scotland and W. Ireland.—*B. M.* Craig Tulloch, Blair Athole, Perthshire.

Spores colourless becoming brownish.

5. **P. Schraderi** A. L. Sm.—Thallus greyish-white, thin, tartareous and somewhat farinose. Perithecia black, globose, deeply immersed and leaving pits in the rock, the ostiole only slightly emerging; perithecial wall entire; spores 8 in the ascus ellipsoid, muriform, usually 3-septate with an irregular longitudinal division, colourless, becoming brownish, about 40–45 μ long, 12–17 μ thick.—*Lichen Schraderi* Sm. Engl. Bot. t. 1711 (1807) (non Ach.). *Lithocia Schraderi* S. F. Gray Nat. Arr. i. 497 (1821). *Verrucaria Schraderi* Winch Bot. Guide Northumberland and Durham, 44 (1805).

Exsicc. Bohl. n. 9, pl. ? (as *Verrucaria rupestris*).

The perithecia are thickly scattered over the stone and tend to grow in concentric lines, a character distinctive of Böhler's plate. There are also present on the surface of the stone small groups of *Verrucaria Dufourii*, probably the "male scattered warts" of Smith's description.

Hab. On chalk or calcareous stones.—*Distr.* Rather rare in limestone districts.—*B. M.* Sussex (specimen collected by W. Borrer): Crickley Hill, near Cheltenham, Gloucestershire; Dovedale, Derbyshire; near Aviemore, Inverness-shire; Lough Gill, Sligo.

6. **P. diminuta** Arn. in Flora xlv. 264 (1861).—Thallus greyish-white, thin, tartareous. Perithecia globose, minute, black, entirely immersed, leaving pits in the rock, the ostiole slightly prominent; perithecial wall entire; asci ventricose (ca. 70–85 μ by 45 μ); paraphyses none; spores 8, colourless then brown, ellipsoid or broadly oblong, muriform, and with a mucilaginous epispore, 22–30 μ long, 9–16 μ thick.—*Verrucaria diminuta* Cromb. in Journ. Bot. xiv. 363 (1876); Leight. Lich. Fl. ed. 3, 491 (*errone diminuta*).

This and the preceding are the only British species of *Polyblastia* that form perithecial pits (foveolate) in the substratum.

Hab. On moist rocks.—*B. M.* Near Cheltenham, Gloucestershire; Morylton Fell, Yorkshire; Recess Road, Connemara, Galway; Lough Gill, Sligo (?).

7. **P. inumbrata** A. L. Sm.—Thallus dark-brownish or greyish, thin, effuse, unequal or dispersed. Perithecia moderate in size, semi-immersed, the ostiole projecting, generally with a minute papilla; perithecial wall thick, black, entire; paraphyses mucilaginous, disappearing; spores 8 in the ascus, oblong-ellipsoid, light-yellowish-brown, muriform, large, 33–62 μ long, 17–32 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria inumbrata* Nyl. in Flora xlvii. 355 (1864); Carroll in Journ. Bot. iii. 292 (1865); Cromb. Lich. Brit. 114; Leight. Lich. Fl. 460; ed. 3, 492.

Nylander describes the spores as colourless, but in the authentic specimens examined they are a clear light-brown with very distinct 1-3 well-marked transverse septa and muriform with small cells.

Hab. On schistose and arenaceous rocks.—*B. M.* Ben Lawers and Craig-na-Lochan (?), Perthshire.

8. ***P. subviridicans*** A. L. Sm.—Thallus pale-greenish, thin, continuous and wrinkled. Perithecia black, embedded in large thalline tubercles, the ostiole papillate, small, depressed; perithecial wall dimidiate; paraphyses none; spores 2 or 4 in the ascus, oblong, colourless, muriform, large, 46-70 μ long, 24-30 μ thick.—*Verrucaria subviridicans* Nyl. in *Flora* lx. 566 (1877); Cromb. in *Grevillea* vi. 114 (1878); Leight. *Lich. Fl.* ed. 3, 488. Specimen not seen.

Considered by Nylander to be very like the preceding, of which it may be a subspecies. He also states that the thallus contains blue-green algæ (gonimiose); that may however be accidental, and due to the moist habitat.

Hab. On stones in torrents.—*Dist.* Rare in W. Ireland, near Kylemore, Connemara, Galway.

9. ***P. subinumbrata*** A. L. Sm.—Thallus greyish-brown, very thin or subevanescent. Perithecia immersed in brownish thalline warts; perithecial wall black, entire; spores similar to those of *P. inumbrata* but smaller, 22-30 μ long, 15-18 μ thick.—*Verrucaria subinumbrata* Nyl. in *Flora* lxi. 246 (1878); Cromb. in *Grevillea* vii. 97; Leight. *Lich. Fl.* ed. 3, 492.

Perhaps only a subspecies of *P. inumbrata* (Nyl. l. c.). The specimen in the herbarium of the British Museum collected by Lerbalestier at the same locality is a form of *P. scotinospora* with small, very dark, muriform spores.

Hab. On schistose rocks, Kylemore, Connemara, Galway (the only locality).

10. ***P. Sendtneri*** Krempelh. in *Flora* xxxviii. 67 (1855).—Thallus whitish-grey, cartilaginous, incrusting, granular, unequal. Perithecia black, minute, globose, semi-immersed, the ostiole depressed; perithecial wall entire; paraphyses mucilaginous, disappearing; spores 8 in the ascus, almost colourless or pallid-brownish, ovoid, muriform, 15-30 μ long, 9-15 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria Sendtneri* Nyl. in *Maine et Loire. Mém. Soc. Acad.* iv. 33 (1858); Carroll in *Journ. Bot.* iii. 292 (1865); Leight. *Lich. Fl.* 459; ed. 3, 490.

The colour of the spores seems to vary a great deal, some authors describing them as brownish, in the specimens examined they are almost colourless.

Hab. On mossy earth in alpine regions.—*B. M.* Ben Lawers, Perthshire.

11. ***P. gelatinosa*** Th. Fr. *Lich. Arct.* 262 (1860) & in *Kgl. Svensk. Vetensk.-Akad. Handl.* vii. 2, 49 (1867).—Thallus thinnish,

effuse, somewhat gelatinous, dark-brownish or blackish. Perithecia moderate in size, semi-immersed, somewhat prominent, the ostiole slightly depressed; perithecial wall entire; paraphyses mucilaginous, disappearing, ostiolar filaments numerous, distinct; asci saccate-clavate; spores 8 in the ascus, oblong-ellipsoid, pale-brownish or almost colourless, muriform, 30–45 μ long, 12–24 μ thick.—*Verrucaria gelatinosa* Ach. Lich. Univ. 283 (1810) (non Nyl. in Maine et Loire Mém. Soc. Acad. iv. 21 (1858)). *V. nigrata* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 430 (1856); Cromb. Lich. Brit. 110; Leight. Lich. Fl. 456; ed. 3, 489. *Sphæromphale nigrata* Mudd Man. 282 (1861).

Leighton has described the spores as dark-brown, but Nylander includes the species in a section with colourless spores. In the specimens examined they are colourless or slightly brownish. Nylander's *Verrucaria gelatinosa* is *Polyblastia helvetica*, not recorded in Britain.

Hab. On mossy earth in alpine places.—*B. M.* Ben Lawers (the only British locality).

12. *P. mortensis* Wats. in Journ. Bot. lv. 108, fig. B. (1917).—Thallus thin, crustaceous, minutely granulose, effuse, continuous, greyish or greenish-grey or olivaceous, sometimes darker or evanescent, not gelatinous when moist. Perithecia small or moderate, semi-immersed with the upper third emergent, convex, shining; perithecial wall black, thin and brown at the base; ostiole slightly depressed; paraphyses few or none; asci clavate, somewhat inflated; paraphyses few or none, mucilaginous; spores oblong, colourless, becoming brownish, muriform, with 7–14 transverse rows of small cells, 40–50 μ long, 16–20 μ thick.—*A. L. Sm. Monogr. i. 483 (1918).*

Near to *P. gelatinosa*, but differs in the lighter-coloured non-gelatinous thallus.

Hab. On soil of walls or on mortar, often on decaying mosses such as *Tortula muralis*.—*Distr.* Near the sea.—*B. M.* Morte, Devon (Dec. 1913).

Spores becoming dark-brown.

13. *P. theleodes* Th. Fr. in Kgl. Svensk. Vetensk.-Akad. Handl. vii. n. 2, 48 (1867).—Thallus greyish-white, thickish, wrinkled-areolate, with thicker wart-like protuberances, sometimes almost disappearing. Perithecia partly enclosed in the warts or superficial, large, hemispherical with a slight depression round the ostiole; perithecial wall black, entire, thicker over the top; paraphyses disappearing; spores 8 in the ascus, broadly ellipsoid, very large, colourless, then dark-brown, muriform, variable, 60–84 μ long, 24–45 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria theleodes* Sommerf. Suppl. Fl. Lapp. 140 (1826); Cromb. Lich. Brit. 110; Leight. Lich. Fl. 457; ed. 3, 489 (incl. f. *verrucoso-areolata*). *V. verrucoso-areolata* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 438 (1856) & in Maine et Loire

Mém. Soc. Acad. iv. 34 (1858); Carroll in Journ. Bot. ii. 292 (1865). *V. subpyrenophora* Leight. Lich. Fl. 454; ed. 3, 486. *Lecanora atra* var. *verrucoso-areolata* Schær. Enum. 73 (1850). *Sphæromphale verrucosa-areolata* Mudd Man. 282, t. 5, fig. 119 (1861).

The thallus varies considerably in thickness; sometimes the perithecia are sessile and the thallus scarcely visible. There is a distinct thin blackish wall at the base of the perithecia, the upper portion being much thicker and easily breaking away. The spores are often smaller than the size recorded, occasionally not longer than 50 μ .

Hab. On rocks.—*Distr.* Rather rare in alpine districts of the British Isles.—*B. M.* Cwm Idwal, Cwm Cywion and Snowdon, Carnarvonshire; Mallerstang, Westmorland; Ben Lawers, Perthshire; Achosragan Hill, Appin, Argyll; Craig Tulloch, Blair Athole, Perthshire; Craig Guie, Braemar, Aberdeenshire; Glendalough (shores of Lower Lake), Wicklow.

Form *inundata* Th. Fr. in Nov. Act. Reg. Soc. Sci. Upsala, Vol. extraordin. n. 8, 11 (1877).—Thallus thin, smooth, somewhat gelatinous. Perithecia semi-immersed in the thallus.—*Verrucaria theleodes* var. *inundata* Nyl. ex Carroll in Journ. Bot. iv. 25 (1866); Cromb. Lich. Brit. 110; Leight. Lich. Fl. ed. 3, 490 (note).

Hab. On moist rocks.—*Distr.* Rare in Wales and in S.W. Ireland.—*B. M.* Inlet to Llyn Idwal, Carnarvonshire (W. Watson); Ballaghbeama, Kerry.

14. *P. scotinospora* Hellb. in Vet. Akad. Förh. 1865, 478.—Thallus whitish or greyish-brown, warted-areolate, sometimes almost obsolete. Perithecia rather large, sessile, prominent, somewhat depressed round the ostiole; perithecial wall incurved at the base and almost entire; paraphyses disappearing; spores 8 in the ascus, ellipsoid, irregular, muriform, brown, 26–40 μ long, 13–21 μ thick or larger.—*Verrucaria scotinospora* Nyl. Lich. Scand. 270 (1861); Cromb. Lich. Brit. 110; Leight. Lich. Fl. 453; ed. 3, 485. *Sphæromphale scotinospora* Mudd Man. 282 (1861).

Zahlbruckner in his Catal. Lich. Univ. has classified this species as *P. melaspora* (*Verrucaria melaspora* Tayl. in Journ. Bot. vi. 153 (1847)). Taylor's specimen is recorded from Carig Mt., Kerry, "on wet mural rocks." There is no specimen in the British Museum nor at Kew.

Hab. On schistose rocks.—*Distr.* Rare in alpine regions.—*B. M.* Cwm Clwyd, Denbighshire; Breadalbane, Ben Lawers, Ben-y-Gloe, Blair Athole, and Tyndrum, Perthshire; Kylemore, Connemara, Galway.

15. *P. Henscheliana* Lönnr. in Flora xli. 631 (1858).—Thallus greyish or dark-brownish, thin, continuous or somewhat cracked. Perithecia rather large, subglobose or hemispherical, the base immersed in the thallus, with a black prominent ostiole; perithecial wall black, almost dimidiate; paraphyses disappearing; spores

8 in the ascus, broadly-oblong, becoming dark-brown, muriform, large, 42–65 μ long, 23–37 μ thick; hymenial gelatine wine-red with iodine.—*Spharomphale Henscheliana* Koerb. Syst. Lich. Germ. 336 (1855). *Verrucaria subumbrina* Nyl. Lich. Scand. 269 (1861) (*vide* Th. Fr. in Nov. Act. Reg. Soc. Sci. Upsala Vol. extraord. 1877, 8, 12); Carroll in Journ. Bot. iii, 292 (1865); Cromb. Lich. Brit. 109; Leight. Lich. Fl. 458; ed. 3, 485. *V. Henscheliana* Cromb. in Journ. Bot. ix. 179 (1871); Leight. Lich. Fl. 457; ed. 3, 489.

Exsicc. Larb. Lich. Hb. n. 198.

Vainio (Lich. Fenn. i. 97 (1921)) has recorded spores measuring $46 \times 64 \mu$ (or rarely up to 90μ) \times 23–38 μ .

Hab. On schistose rocks near lakes, etc.—*Distr.* Rare in mountainous districts of N. Scotland and W. Ireland.—*B. M.* Near Perth and Ben Lawers, Perthshire; Lough Dan, Wicklow; Lough Feagh, Connemara, Galway.

16. **P. nigrítella** A. L. Sm.—Thallus black, effuse. Perithecia small, black, semi-immersed, somewhat prominent, the ostiole minute; perithecial wall entire; paraphyses mucilaginous, disappearing; asci elongate-clavate; spores 8 in the ascus, irregularly ellipsoid, dark-brown, variously muriform with few irregular cells, small, 21–36 μ long, 9–14 μ thick (usually 20–22 μ long, 10–12 μ thick); hymenial gelatine wine-red or tawny-yellowish with iodine.—*Verrucaria nigrítella* Nyl. in Flora xlviii. 357 (1865); Carroll in Journ. Bot. iv. 25 (1866); Cromb. Lich. Brit. 110; Leight. Lich. Fl. 466; ed. 3, 497.

Judging from the description, similar to if not identical with *P. gothica* (Th. Fr. Bot. Not. 1865, 112), which differs, however, in having more inflated asci and slightly narrower spores. Leighton quotes *Parmelia scruposa* var. *bryophila*, pro parte (Angioc. Lich. t. 11, f. 3b) as representing the spores of this species. A minute fungus, on the *Dermatocarpon* squamules, agrees except in the host with *Thelidium superpositum*; it is also akin to *Pharcidia gyrophoræ* (Arn.) Zopf in Nova Acta Acad. Cæs. Leop.-Carol. lxx. 117 (1897).

Hab. On peaty earth between the squamules of *Dermatocarpon cinereum*.—*B. M.* Ben Lawers, Perthshire (the only British locality).

17. **P. gothica** Th. Fr. in Bot. Not. 1865, 112.—Thallus thin, greenish or dark-coloured, effuse. Perithecia black, small, semi-immersed, the ostiole indistinct; perithecial wall entire; paraphyses indistinct; ostiolar filaments short; ascus rather broad, subventricose; spores ellipsoid, becoming somewhat fusiform, dark-brown, at first 3- then 5–7-septate and irregularly muriform, 18–28 μ long, 7–9 μ thick.—*Verrucaria pituphloia* Leight. Lich. Fl. 458 (1871) (*vide* Th. Fr. in K. Svensk. Vetensk. Soc. Nov. Act. 1877, 8, 26). *V. gothica* Leight. *op. cit.* ed. 3, 490 (1879).

Th. Fries (*l. c.*) recognizes the resemblance of this species to a *Sphaeria*.

Hab. On decaying mosses and humus (*P. gothica*); on larch-poles (*V. pituphloia*).—*Distr.* Shrewsbury, Shropshire.

18. *P. peltophora* A. L. Sm.—Thallus squamulose, the squamules thin, green, smooth, either approximate or scattered. Perithecia black, large, prominent; perithecial wall dimidiate; paraphyses few, filiform, interspersed with oily granules; ostiolar filaments (periphyses) numerous; spores 8 in the ascus, dark-brown, ellipsoid, muriform, rather large, 35–48 μ long, 20–30 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria peltophora* Stirton in *Grevillea* iii. 37 (1874); Leight. Lich. Fl. ed. 3, 486. Specimen not seen.

Should possibly be placed next to *P. tristicula* on p. 329.

Hab. On earth, Ben Lawers, Perthshire.

113. **THROMBIUM** Wallr. Fl. Crypt. Germ. 1, 287 (1831); emend. Massal. Ric. Lich. 156 (1852). *Inoderma* S. F. Gray Nat. Arr. i. 498 (1821) pro parte. *Verrucaria* subgen. *Inoderma* Ach. Lich. Univ. 294 (1810). (Pl. 47.)

Thallus crustaceous, uniform, membranaceous, mucilaginous, thin, sometimes developed within the substratum or altogether wanting. Algal cells Protococcaceæ. Perithecia simple, immersed in the thallus or superficial, the outer wall of a carbonaceous or horny structure, light or dark-coloured, opening by a poriform ostiole; paraphyses slender, branched, persistent; asci 4–8-spored; spores ellipsoid, simple, colourless or brownish.

The only British genus of simple-spored Verrucariaceæ with persistent paraphyses. Acharius's subgenus *Inoderma* represented species of *Verrucaria* with a somewhat soft thallus. S. F. Gray raised it to generic rank and included in it two British species, *I. epigæa* and *I. byssacea*, the latter of doubtful position, based on *Sphaeria byssacea* Weig. Obs. Bot. 42, t. 2, f. 9 (1772) which Nylander considered to be the spermogonial form of *Arthonia pruinosa* (*pruinata*) (Flora xxxviii. 297 (1855)). Almquist describes it as *Arthonia byssacea* (K. Svensk. Vet.-Akad. Handl. xvii. n. 6, 25 (1880)), while Arnold (Flora lxvii. 594 (1884)) referred it to *Lecanactes byssacea*, synonymous with Almquist's species.

1. *Thr. lætevirens* A. L. Sm.—Thallus forming a broadly effused rather thick inseparable film, smooth, even, rather gelatinous, bright olive-green, the lobed margin paler and yellowish; gonidia protococcoid, globose, 12–15 μ in diameter. Perithecia minute, crowded, globose, entire, black, completely immersed in the thallus, with a minute black ring round the ostiole; asci clavate; spores ellipsoid, simple, colourless, 11–12 μ long, 6 μ thick; paraphyses scanty, slender, cylindrical; spermogones immersed, mixed with the perithecia, with filiform straight sterigmata and simple cylindrical straight spermatia, 8–9 μ long, 2 μ thick.—*Verrucaria lætevirens* Massee in Journ. Bot. xxx. 193, t. 324, figs. 1–9 (1892).

Differs from other maritime simple-spored forms in the presence of paraphyses.

Hab. On smooth rocks between tide-marks.—*Distr.* Somewhat rare on Northern, East and West coasts (Berwick-on-Tweed, Northumberland; Burnmouth, Berwickshire; Gareloch, Dumbartonshire; Cumbrae, Buteshire; Loch Goil, Argyll).

2. *Thr. epigæum* Wallr. Naturgesch. Flecht. i. 265 (1825) (nomen) & Fl. Crypt. Germ. i. 294 (1831).—Thallus pale-brown, or yellowish-green, thin, effuse, gelatinous when moist, somewhat furfuraceous when dry. Perithecia small, black, globose, immersed in the thallus, the upper part only visible; perithecial wall entire, thicker above; spores oblong, ellipsoid or irregularly ovoid, rather large, 18–25 μ long, 5–11 μ thick.—*Sphæria epigæa* Pers. Syn. Fung. Add. xxvii. (1801). *Verrucaria epigæa* Ach. Meth. 123 (1803); Winch Fl. North. & Durh. 86 (1831); Hook. in Sm. Engl. Fl. v. 155; Tayl. in Mackay Fl. Hib. ii. 96; Leight. Angioc. Lich. 64, t. 27, fig. 4 & Lich. Fl. 415; ed. 3, 446; Mudd Man. 293; Cromb. Lich. Brit. 116. *Lichen terrestris* Sm. Engl. Bot. t. 1681 (1807). *Inoderma epigæa* S. F. Gray Nat. Arr. i. 498 (1821).

Hab. On soil.—*Distr.* Rather rare throughout the British Isles.—*B. M.* Hassocks, Maresfield and Tilgate, Sussex; Cradley, Herefordshire; Hales End near Malvern, Worcestershire; Mardale, Westmorland; Ross, Clare; Connemara, Galway.

3. *Thr. thelostomum* A. L. Sm.—Thallus reddish-brown, thin, continuous, minutely cracked-areolate, suborbicular and determinate. Perithecia reddish-brown, sessile, hemispherical, becoming widely depressed round the ostiole; perithecial wall entire, reddish-brown above, paler below; paraphyses slender, thread-like, sometimes branched; spores ellipsoid, colourless, 17–20 μ long, 9–10 μ thick, or sometimes rather larger.—*Verrucaria thelostoma* Ach. ex Harrim. in Winch Bot. Guide ii. 44 (1807); Mudd Man. 293; Leight. Lich. Fl. 421; ed. 3, 452. *Lichen thelostomus* Sm. Engl. Bot. t. 2153 (1810). *Pyrenula umbonata* Ach. Lich. Univ. 316 (1810); S. F. Gray Nat. Arr. i. 493. *Segestria thelostoma* Fr. Lich. Eur. 429 (1831). *Segestrella thelostoma* Leight. Angioc. Lich. 34, t. 15, f. 2 (1851). *Lecanora thelostoma* Hook. in Sm. Engl. Fl. v. 189 (1833).

Distinguished by the wide depression round the scarcely visible ostiole, hence the resemblance to a lecanorine apothecium.

Hab. On whinstone rocks.—*B. M.* Egglestone, Durham.

114. **GONGYLIA** Koerb. Syst. Lich. Germ. 351 (1855). (Pl. 48.)

Thallus crustaceous, not corticated. Algal cells Protococcaceæ. Perithecia almost sessile, soft in texture, bright- or dark-coloured with a poriform ostiole; paraphyses slender, free; asci 4–8-spored; spores acicular, straight or somewhat bent, colourless, multiseptate.

A small genus, with representatives in North and Central Europe. The ostiole is very distinct, and tends to widen out at maturity, causing the perithecia to become almost disciform.

G. viridis A. L. Sm.—Thallus bright-green when fresh, thin, spreading. Perithecia numerous, shining-black when moist, globose, slightly immersed at the base, the ostiole very distinct, becoming wider; perithecial wall soft, black, rather uneven on the exterior, dimidiate, the inner wall dark blue-green; asci elongate-clavate, bent at the base, about $140\ \mu$ long, $10\text{--}12\ \mu$ thick; paraphyses longer than the asci, numerous, thread-like; spores narrowly fusiform-acicular, somewhat abruptly narrower upwards or blunt, gradually tapering towards the base, colourless, multi-guttulate becoming multi-septate, $60\text{--}65\ \mu$ long, $2\text{--}3\ \mu$ thick.

The thallus follows the inequalities of the soil, and thus shows a somewhat granular surface; it is nearly allied to *G. sabuletorum*, a species found in Central Europe, but differs in the thallus and the much longer spores.

Hab. On sandy soil by the side of a path.—*B. M.* Near Horsley, Netley Heath and Gomshall, Surrey; Epping Forest, Essex; Royston, Herts; near Harlech, Merioneth.

115. **MICROGLÆNA** Koerb. Syst. Lich. Germ. 388 (1855); emend. Lönnroth in Flora xli. 632 (1858). *Thelenella* Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. 193 (1855), and in Maine et Loire Mém. Soc. Acad. iv. 62 (1858). (Pl. 49.)

Thallus crustaceous, non-corticated. Algal cells Proto-coccaceæ. Perithecia simple, immersed or almost free, globose or conical; paraphyses persistent, branched; asci 2–8-spored; spores ellipsoid, muriform, colourless or brownish.

1. **M. modesta** A. L. Sm.—Thallus whitish, thin, continuous or somewhat cracked and unequal. Perithecia embedded in small protuberances of the thallus, subglobose; perithecial wall soft and colourless at the base, brownish upwards to dark-brown round the ostiole; paraphyses slender, distinct; asci elongate-clavate 4–8-spored; spores ellipsoid, colourless, muriform, $19\text{--}38\ \mu$ long, $11\text{--}18\ \mu$ thick; spermatogones with slender bent spermatia, $18\text{--}32\ \mu$ long, $1\ \mu$ thick.—*Verrucaria modesta* Nyl. in Bot. Not. 1853, 164; Leight. Lich. Fl. ed. 3, 492. *V. Carrollii* Nyl. ex Cromb. Lich. Brit. 119 (1870); Leight. Lich. Fl. 455; ed. 3, 487. *Thelenella modesta* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 438 (1856); Cromb. in Journ. Bot. xiv. 363 (1876). *Sphæromphale Carrollii* Mudd Man. 283, t. 5, fig. 115 (1861). *Polyblastiopsis Carrollii* A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, 65 (1903).

Hab. On trees.—*Distr.* Rare in S.W. England and S. Ireland.—*B. M.* Barnsley Park, Gloucestershire. Recorded from Rostellan, Cork.

2. *M. isidioides* A. L. Sm.—Thallus yellowish-brown, smooth, crustaceous-cartilaginous, or subsquamulose, rather thick, areolate, the areolæ crowded, convex. Perithecia immersed in the areolæ, minute; perithecial wall brownish below, darker upwards, dark-brown towards the ostiole; paraphyses slender, persistent, conglutinate; spores 8 in the ascus (or fewer), ellipsoid-fusiform, colourless, then becoming brown, muriform, rather large, 30–46 μ long, 12–16 μ thick.—*Ferrucaria isidioides* Borr. in Engl. Bot. Suppl. t. 2622, fig. 1 (1830); Carroll in Journ. Bot. iv. 25 (1866); Cromb. Lich. Brit. 117; Leight. Lich. Fl. 454; ed. 3, 486. *Pertusaria isidioides* Hook. in Sm. Engl. Fl. v. 160 (1833). *Porina isidioides* Tayl. in Mackay Fl. Hib. ii. 102 (1836). *Endocarpon isidioides* Leight. Angioc. Lich. 20, t. 6, fig. 4 (1851). *Dermatocarpon isidioides* Mudd Man. 270 (1861).

Hab. On rocks.—*B. M.* Glengariff near Bantry, Cork (the only locality).

3. *M. corrosa* Arn. in Verh. Zool.-bot. Gesellsch. Wien xxvii. 555 (1877) and in Flora lxviii. 155 (1885).—Thallus whitish or dirty-white, warted or granular and dispersed or obsolete. Perithecia minute, black, embedded in the swollen thalline warts (when present), the upper part protruding; perithecial wall dimidiate; paraphyses distinct, slender, loosely coherent; asci subcylindrical; spores 8 in the ascus, ellipsoid-fusiform, colourless, becoming muriform, 18–22 μ long, 7–11 μ thick.—Var. *nericiensis* A. L. Sm. Monogr. ii. 309 (1911). *Microglæna nericiensis* Hellb. Nerikes Lafflora, 123 (1871). *Limboria corrosa* Koerb. Syst. Lich. Germ. 376 (1885).

The specimens from Wales and Scotland were collected by H. B. Holl, and called by him *Ferrucaria dispersa*. The thallus is broken up into the small scattered warts that form the bases of the perithecia; the spores are at first simple, then finally septate and muriform.

Hab. On rocks in alpine regions.—*Distr.* Rare in N. Wales and the Scottish Grampians.—*B. M.* Cader Idris, Merioneth; Ben Lawers, Perthshire; Lough Nahanagan, Wicklow (*M. C.* Knowles).

4. *M. nuda* Wheld. & Trav. in Journ. Linn. Soc. xliii. 132 (1915).—Thallus obsolete or reduced to a few cinereous granules at the base of the perithecia. Perithecia minute, black, superficial, dimidiate, with a distinct somewhat depressed ostiole; paraphyses subpersistent, visible until the spores are fully formed, branched, slender; asci cylindrical; spores 8 in the ascus, irregularly arranged, 2–3-septate, becoming sparingly and irregularly septate longitudinally, the cells unequal, colourless or pale-greenish, oblong-ellipsoid, obtuse at both ends, 14–22 μ long, 6–9 μ thick.—A. L. Sm. Monogr. Brit. Lich. i. 484 (1918).

First recorded on half-buried gritstone pebbles in glacial drift on the banks of the Ribble at Chatburn (March, 1913). It is very near to *M. corrosa*.

Hab. On stones.—Evidently rare in S.W. and N. England.—*B. M.* On half-buried stones in field, Cothelstone, near Taunton, Somerset (W. Watson).

5. *M. breadalbensis* Wheld. & Wils. in Journ. Bot. liii. Suppl. 71 (1915).—Thallus pale citrine-yellow, smooth, broken into scattered or more contiguous subangular fragments, each bearing one or rarely two perithecia. Perithecia small, subglobose, slightly immersed at the base, black; perithecial wall black and thick above, thinner towards the base, where it forms a thin brown line; ostiole poriform, slightly protuberant but hardly papillæ-form; spores 6-8 in the ascus irregularly biseriate, colourless, ellipsoid-oblong, obtuse at one or both ends, 6-7-septate, with 1-3 longitudinal septa, 18-20 μ long, 10 μ thick.—*A. L. Sm.* Monogr. Brit. Lich. i. 484 (1918). Specimen not seen.

Hab. On mica-schist rocks, growing amongst *Lecidea contigua* in larger or smaller patches. Collected by A. Wilson at Ben Cruichben, near Killin, Perthshire (June, 1913).

6. *M. Holliana* A. L. Sm.—Thallus scanty, whitish, granular or none. Perithecia dark-brown when dry, clear brown when moist, scattered or crowded, sometimes two or more cohering, conical, semi-immersed; perithecial wall colourless below, becoming a clear brown upwards; paraphyses slender, rather scanty, persistent; asci elongate-oblong, 8-spored; spores large, ellipsoid-fusiform, sometimes slightly constricted in the middle, colourless, muriform, with small cells, 50-60 μ long, 15-17 μ thick.

Differs from *M. muscorum* Th. Fr. (Lich. Arct. 362 (1860)) in the semi-parasitic habit, the colour of the perithecia, in 8-spored asci and in smaller spores. Collected by H. B. Holl.

Hab. On the ground on thallus of *Cladonia*, mosses, &c.—*B. M.* Dolgelly, Merioneth (the only locality).

116. **STAUROTHELE** Norm. in Nyt. Mag. Naturv. vii. 240 (1853); emend. Th. Fr. Lich. Arct. 263 (1860) & in Nov. Act. Reg. Soc. Sci. Upsala, Vol. extraord. n. 8, 3 (1877).—*Sphæromphale* Reichenb. Consp. Reg. Veg. 20 (1828) pro parte; Mudd Man. 281 pro parte. (Pl. 50.)

Thallus variously crustaceous, not corticated, sometimes developed within the substratum. Algal cells Protococcacææ. Perithecia simple, superficial or immersed in the thallus with poriform ostioles, and with hymenial gonidia (algal cells); paraphyses mucilaginous, disappearing; asci broadly clavate, 1-8-spored; spores large, ellipsoid, muriform, colourless or dark-coloured.

Differs from *Polyblastia* in the presence of hymenial gonidia, which are usually small, roundish, cuboid or slightly elongate and rod-like, and occur in loose lines or masses between the asci. They are ejected from the perithecium along with the spores.

Spores colourless.

1. *St. hymenogonia* Th. Fr. in Bot. Not. 1865, 40; A. Zahlbr. in Krypt. exs. 177, in Ann. Nat. Hofmuseum Wien xi. 97 (1896). Thallus whitish or pale-grey or brownish, thin, tartareous and somewhat powdery or evanescent. Perithecia moderate in size, semi-immersed, soft in texture and somewhat scabrid, prominent, convex; perithecial wall entire: paraphyses none; spores 8 in the ascus, linear-oblong, colourless, at first 1-septate and then muriform, 18–34 μ long, 11–19 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria muralis* Borr. in Engl. Bot. Suppl. t. 2647, fig. 2 (1830)? Leight. Angioc. Lich. 46, t. 20, fig. 1 (1851) (non Ach.). *V. hymenogonia* Nyl. in Act. Soc. Linn Bord. sér. 3, i. 430 (1856); (Cromb. Lich. Brit. 115; Leight. Lich. Fl. 460; ed. 3, 491. *Spharomphale hymenogonia* Mudd Man. 282 (1861).

Exsicc. Larb. Lich. Hb. n. 199.

The identity of Borrer's plant is doubtful, but he describes it as "internal substance green." Easily confused with *Verrucaria muralis*, as thallus and substratum are very similar, the perithecia, however, are rather larger, and the two are readily distinguished by internal characters. The hymenial gonidia are rod-like 3–6 $\mu \times 2 \mu$ (Zschacke in Hedwigia liv. 197 (1914)).

Hab. On calcareous or arenaceous rocks, and mortar, &c.—*Distr.* Very rare throughout the British Isles.—*B. M.* Mount Edgecumbe, Cornwall; Downs, Sussex; Hyde and Cirencester, Gloucester; Newmarket Heath, Cambridge; Arnside, Westmorland; Ben Lawers, Perthshire; Glanmire, Cork.

Spores becoming brown, 1 or 2 in the ascus.

2. *St. umbrinum* A. L. Sm.—Thallus brownish or dark-brown, thin, smooth, unequally cracked-areolate. Perithecia innate in a swelling of the thallus, the ostioles projecting; perithecial wall dimidiate; paraphyses disappearing; asci broadly clavate, 2-spored; spores oblong or obovate-oblong, muriform, becoming dark-brown, large, 36–50 μ long, 12–20 μ thick.—*Verrucaria lithina* Ach. Meth. Suppl. 18 (1803)? *V. umbrina* Fr. Lich. Eur. 441 (1831) (non Ach. nec Wahlenb. Fl. Suec. 871 *vide* Th. Fr. Lich. Arct. 270); (Cromb. Lich. Brit. 109; Leight. Lich. Fl. 453; ed. 3, 484. *V. fissa* Tayl. in Mackay Fl. Hib. ii. 95 (1836). *Endocarpus lithinum* Leight. Angioc. Lich. 19, t. 6, fig. 2 (1851). *E. fissum* Leight. tom. cit. 20, t. 6, fig. 3. *Spharomphale umbrina* Mudd Man. 281 (1861).

Exsicc. Leight. n. 98 pro parte.

The nomenclature of this plant is still a debatable question. *Verrucaria lithina* Ach. accepted by Leighton has again been revived by A. Zahlbr. (Syll. Lich. Univ. 167 (1921)). Vainio (Lich. Fenn. 88 (1921)) has ruled out that citation and has adopted *V. fissa* Tayl.; this name is, however, antedated by *V. umbrina* Fr. which has been almost universally accepted for this plant. The hymenial gonidia are somewhat globose.

Hab. On rocks in or near rivers and lakes.—*Distr.* Rare in upland regions.—*B. M.* Ystrad-ffin, Carmarthenshire; Llandyssil, Cardiganshire; Llangollen, Denbighshire; Rocks in river Kent, above Scroggs Bridge, Westmorland; Sunday's Well, Cork; Ardglass, Down.

3. *St. clopima* Th. Fr. Lich. Arct. 263 (1860).—Thallus brownish, thickish, tartareous, warted-areolate, the areolæ somewhat tumid and rounded. Perithecia immersed in the thallus, with a depressed ostiole; perithecial wall dimidiate, black; paraphyses none; spores 1 or 2 in the ascus, oblong, colourless, becoming dark-brown, muriform, large, 32–58 μ long, 12–30 μ thick; hymenial gelatine reddish-blue with iodine.—*Verrucaria clopima* Wahlenb. in Ach. Meth. Suppl. 19 (1803); Carroll in Journ. Bot. iii. 292 (1865)? Leight. Lich. Fl. ed. 3, 485.

Differs from the preceding in the form and development of the thallus. A specimen in the British Museum from Dawros River, collected by Lerbalestier and recorded by him under this species, is *Verrucaria viridula*. The gonidia of this species are protococcoid; those in the hymenium are smaller, oblong or ellipsoid, rarely elongate and occasionally septate.

Hab. On rocks in or near rivers.—*Distr.* Rare in W. Ireland. In lower L. Macneam, Belcoo, Fermanagh; Lough Gill, Sligo.

4. *St. ebborensis* Wats. in Journ. Bot. lv. 315 (1917).—Thallus crustaceous, greyish-white, algal cells green (Protococcaceæ). Perithecia small, dark, minutely papillate, innate or slightly emergent and convex; perithecial wall entire; ostiole depressed; hymenial gonidia subsphæroid; asci clavate; paraphyses disappearing, the osteolar filaments (periphyses) many; spores oblong, colourless or brownish 1 to 2 in the ascus, at first 1–3-septate, then irregularly muriform, 28–45 μ long, 14–19 μ thick; hymenial gelatine blue with iodine.

Very near to *St. umbrina*, but differing in habitat, the colour of the spores and in the thallus, which is tartareous-farinose, surrounded by a dark line. The perithecia leave pits in the substratum, in this and in the appearance of the thallus resembling *St. cæsia*, a continental species with 8 spores in the ascus.

Hab. On carboniferous limestone.—*B. M.* Ebbor Gorge, Mendip, Somerset (April 1917).

Spores brown, 4–8 in the ascus.

5. *St. rupifraga* Arn. in Verh. K.K. Zool.-Bot. Ges. xxx. 149 (1880).—Thallus dark-bluish-grey or whitish, or smoky-brown, tartareous-farinose, effuse, thin, sometimes evanescent or immersed in the stone. Perithecia minute, globose, immersed in the rock or emergent, leaving pits, somewhat plane above, the ostiole a minute pore; perithecial wall entire; paraphyses disappearing; spores 4–8 in the ascus, ovoid-oblong, becoming dark-reddish-brown, muriform, 36–55 μ long, 12–20 μ thick or larger; hymenial gelatine wine-red with iodine.—*Polyblastia*

rupifraga Massal. Symm. Lich. 100 (1855). *Verrucaria umbrina* var. *calcareæ* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 426 (1856); Cromb. Lich. Brit. 109. *V. rupifraga* Nyl. ex Cromb. Lich. Brit. 109 (1870); Leight. Lich. Fl. 456; ed. 3, 488. *V. terebrata* Leight. Lich. Fl. 456 (1871); ed. 3, 488. *Sphæromphale terebrata* Mudd Man. 281 (1861).

Sometimes the perithecia are so immersed as to be visible merely as minute black points in the stone. The spores are divided into small cells without any definite transverse septa. The hymenial gonidia are roundish.

Hab. On calcareous rocks.—*Distr.* Rare in W. England, N. Scotland and W. Ireland.—*B. M.* Sapperton, Gloucestershire; Berwig, near Wrexham, Denbighshire; Cunswick Scar, Westmorland; Craig Guie, Braemar, Aberdeenshire; Assynt, Sutherland; Kylemore, Connemara, Galway.

Family XXXI. PYRENULACEÆ.

Thallus crustaceous, superficial or developed within the substratum, not corticated. Algal cells *Trentepohlia*. Perithecia simple, globose or semi-globose, more or less immersed, opening by a pore at the apex (*ostiole*). Spermatogones small, globose or ovoid, with simple or sparingly branched sterigmata and spermatia produced apically.

Distinguished by the yellowish filamentous gonidia (*Trentepohlia*), and also by the almost constantly persistent paraphyses. There are nine genera represented in the British Islands:—

Perithecia scattered.

Paraphyses branched, entangled or wanting.

Asci cylindrical, spores uniseriate.

Spores 1-septate 117. *Acrocordia*.

Asci clavate or ovate, spores more or less massed.

Spores colourless.

Spores elongate - fusiform, 1-5-septate 118. *Arthopyrenia*.

Spores elongate - acicular, multi-septate 119. *Leptorhaphis*.

Spores brown.

Spores 1-5-septate 120. *Microthelia*.

Paraphyses unbranched, distinct.

Spores colourless, 8 in the ascus.

Spores 1-pluri-septate 121. *Porina*.

Spores muriform 122. *Clathroporina*.

Spores colourless, many in the ascus.

Spores 1-3-septate 123. *Thelopsis*.

Spores brown.

Spores 1-5-septate with short cells 124. *Pyrenula*.

Perithecia often united.

Spores brown, muriform 125. *Anthracothe-cium*.

117. **ACROCORDIA** Massal. Gen. Lich. 17 (1854). (Pl. 51.)

Thallus crustaceous. Perithecia simple, globose or semi-globose and somewhat conical, black, semi-immersed; paraphyses persistent, slender, branched and entangled; asci cylindrical-oblong, 8-spored; spores uniseriate in the ascus, ellipsoid, 1-septate, colourless. Spermogones small, globose, with rod-like spermatia.

Frequently classified as a "Section" of *Arthopyrenia*, but sufficiently distinct in the more persistent paraphyses and in the broadly ellipsoid non-constricted spores which are arranged in a straight or oblique row in the elongate narrow asci.

1. **A. gemmata** Koerb. Syst. Lich. Germ. 356 (1855).—Thallus white or greyish-white, thin, nearly smooth or somewhat pulverulent, continuous or sometimes cracked, effuse or limited by a dark hypothallus. Perithecia black, large (up to 1 mm. diam.), prominent, hemispherical, immersed at the spreading base, usually with a papillate ostiole; perithecial wall dimidiate with an inner thin brown entire layer; paraphyses long, slender; spores broadly oblong, 1-septate, colourless, 15–29 μ long, 7–13 μ thick.—*Lichen gemmatus* Ach. Lich. Suec. Prodr. 17 (1798). *Verrucaria gemmata* Ach. Meth. 120, t. 3, fig. 1 (1803); Borr. in Engl. Bot. Suppl. t. 2617, fig. 2; Hook. in Sm. Engl. Fl. v. 150; Tayl. in Mackay Fl. Hib. ii. 89; Leight. Angioc. Lich. 43, t. 18, figs. 4 & 5 & Lich. Fl. 430; ed. 3, 462; Cromb. Lich. Brit. 118. *Lejophlea gemmata* S. F. Gray Nat. Arr. i. 496 (1821). *Thelidium gemmatum* Mudd Man. 297 (1861).

Exsicc. Bohl. n. 114; Carroll Lich. Hib. n. 33; Johns. n. 472; Larb. Lich. Hb. n. 196; Leight. n. 136; Mudd. n. 285.

This lichen is referred by A. Zahlbruckner (Catal. Lich. Univ. 315 (1922)) to *Arthopyrenia alba* based on *Verrucaria alba* Schrad. Spicil. Fl. Germ. i. 109 (1794). It has been considered advisable to retain the above name as there is some doubt as to the nature of the perithecial wall in *V. alba*.

Hab. On trunks of trees.—*Distr.* Common throughout the Channel Islands, England, Wales, and S. and S.W. Ireland; rare in Scotland.—*B.* M. Trinity, Jersey; Lanhydrock Park, Cornwall; Torquay, Devon; near Brighton, Erringham, Wiston and Woodman-cote, Sussex; near Lyndhurst, New Forest, Hants; Batheaston, Somerset; near Cirencester, Gloucestershire; Thorndon Hall, Walthamstow and Epping Forest, Essex; Haughmond Hill, Church Stretton and near Shrewsbury, Shropshire; Newton, near Worcester; Dolgelly, Merioneth; Llandudno, Carnarvonshire; Yoxall, Burton-on-Trent, Staffordshire; Madingley Park, Cambridgeshire; King's Lynn, Norfolk; near Ayton, Cleveland, Yorkshire; Rydal and Levens Park, Kendal, Westmorland; Lamplugh, Cumberland; Aberfeldy, Perthshire; Lochaber, Inverness-shire; Carrigaloe, Summerstown, Castle-martyr and Ballyedmond, Cork; near Derrycunihy, Dinish Island and Killarney, Kerry; Castleconnel and Adare, Limerick; Dromoland, Clare.

2. *A. biformis* Arn. in Flora xliv. 537 (1861).—Thallus effuse, white or whitish-grey, thin, somewhat pulverulent, sometimes slightly cracked or wrinkled. Perithecia numerous, small, semi-immersed, prominent, the ostiole at first a minute pore becoming widened and torn; perithecial wall incurved, thin under the base; paraphyses slender, numerous; spores obliquely uniseriate, sometimes almost biseriate, ellipsoid, 1-septate, colourless, 12–16 μ long, 5–7 μ thick.—*Verrucaria biformis* Borr. in Engl. Bot. Suppl. n. 2617, fig. 1 (1829); Hook. in Sm. Engl. Fl. v. 150; Tayl. in Mackay Fl. Hib. ii. 89; Leight. Angioc. Lich. 37, t. 16, f. 2 & Lich. Fl. 439; ed. 3, 468; Cromb. Lich. Brit. 119. *Thelidium biformis* Mudd Man. 297 (1861).

Exsicc. Johns. n. 473; Leight. n. 100; Mudd n. 286.

Nearly allied to the preceding, but differing in the more numerous smaller apothecia and smaller spores, which are often unequally 2-celled and tapering towards the base. The perithecial wall is described by Leighton and Mudd as entire, but although black and thick over the upper surface, it is brown below, the perithecium being seated on the substratum.

Hab. On trunks of trees.—*Distr.* Somewhat common throughout England, Wales and Ireland, not reported from Scotland.—*B. M.* Torquay, Devon; St. Leonard's Forest, Woolsenbury, Clayton and Poynings, Sussex; Hadleigh Woods, Springfield, Hatfield Peverel and Walthamstow, Essex; Shere, Surrey; Gopsall, Leicestershire; Yoxall, Staffordshire; Shelton Rough near Shrewsbury, Shropshire; Harlech, Merioneth; Bettws-y-Coed, Carnarvonshire; Ayton, Cleveland, Yorkshire; I. of Man; Keswick, Cumberland; Taymouth Castle, and Killiecrankie, Perthshire; Fort Augustus, Inverness-shire; Tullageen, Cork; Ardtully and Dromore, near Dunkerron and near Killarney, Kerry; Clonmel, Tipperary; Adare and Castleconnel, Limerick; Kylemore and Renvyle, Connemara, Galway; Westport, Mayo.

Var. *conformis* A. L. Sm.—Similar to the species, but differing in the more distinctly dimidiate perithecial wall, and occasionally in the biguttulate contents of the spore-cells.—*Verrucaria conformis* Nyl. in Flora xlvii. 357 (1864); Carroll in Journ. Bot. vi. 101 (1868); Cromb. Lich. Brit. 119; Leight. Lich. Fl. 430; ed. 3, 463.

Exsicc. Larb. Lich. Hb. (without number).

Hab. On bark of trees.—*Distr.* Rare in Channel Islands, W. Scotland, Wales and S. and W. Ireland.—*B. M.* Jersey; Inverary, Argyll; Ballynahinch, Galway.

3. *A. epipolæa* A. L. Sm.—Thallus greyish or whitish, sometimes tinged with rose, tartareous or powdery, very thin, finely areolate at the centre, penetrating the rock to 550 μ , sometimes seemingly obsolete. Perithecia dull-brownish-black, sometimes partly pruinose, rather large but mixed with smaller, conical or hemispherical, slightly immersed, spreading at the base, the ostiole papillate, shining; perithecial wall dimidiate; paraphyses numerous, slender; asci cylindrical; spores oblong or broadly

ellipsoid, 1-septate, 15–28 μ long, 7–11 μ thick.—*Verrucaria epipolæa* Borr. in Engl. Bot. Suppl. t. 2647, fig. 3 (1830) (non Ach.); Hook. in Sm. Engl. Fl. v. 154; Tayl. in Mackay Fl. Hib. ii. 92; Leight. Angioc. Lich. 61, t. 26, fig. 2. *V. conoidea* Fr. Lich. Eur. 432 (1831); Cromb. Lich. Brit. 118; Leight. Lich. Fl. 430; ed. 3, 460. *Sagedia calcarea* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. 39, t. 4, f. 12 (1854). *Thelidium conoideum* Mudd Man. 296 (1861).

Ersicc. Johns. n. 474; Leight. n. 31; Mudd n. 284; Larb. Lich. Hb. n. 118.

The tinge of rose in the thallus is due, according to Bachmann, to the presence of a sterile parasitic fungus (Nov. Act. Acad. Leop.-Carol. Deutsch. Acad. Nat.-forsch. Halle CV. n. i. 32 (1919)).

The specific name *conoidea* is retained by Zahlbruckner (Catal. Lich. Univ. 321 (1922)). It is based on *Verrucaria conoidea* Fr., but that is antedated by the citation from Engl. Bot. Suppl., the published plate being dated 1830.

Hab. On calcareous (or arenaceous) rocks.—*Distr.* Rather common throughout England, Wales and Ireland, rare in Scotland.—*B. M.* Shanklin, I. of Wight; Torquay, Devon; Hyde, Gloucestershire; Leigh Woods, Clifton, Somerset; Llanymynech and Llanorda, Oswestry, Shropshire; near Monmouth; Carig Cennen, Carmarthenshire; Harlech, Merioneth; Beddgelert and Great Orme's Head, Carnarvonshire; Youlgreave and Buxton, Derbyshire; Llangollen and Minera near Wrexham, Denbighshire; Inglestone and Ingleby, Cleveland, Yorkshire; Levens, Westmorland; Alston, Cumberland; near Cork; Derryquin, Kerry; Ballinakill, Connemara, Galway.

4. *A. Salweii* A. L. Sm.—Thallus white or greyish, thin, tartareous, powdery or nearly obsolete. Perithecia black, rather large, prominent, almost globose, slightly immersed or almost entirely sessile, somewhat wrinkled, the ostiole poriform; perithecial wall thick, black, entire; paraphyses numerous, slender, distinct; asci cylindrical; spores oblong or broadly ellipsoid, 1-septate, 21–23 μ long, 8–11 μ thick.—*Verrucaria gemmata* subsp. *Salweii* Leight. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 435 (1856). *V. Salweii* Leight. ex Cromb. Lich. Brit. 118 (1870); Leight. Lich. Fl. 439; ed. 3, 469. *Thelidium Salweii* Mudd Man. 296 (1861).

Closely allied to the preceding, but differing in the entire perithecial wall and the non-papillate ostiole.

Hab. On calcareous or arenaceous rocks and mortar of walls.—*Distr.* Rare in S. and W. England and in S. and W. Ireland.—*B. M.* Near Taunton, Somerset; near Hurstpierpoint, Sheffield Park and Danny, Sussex; Oswestry, Shropshire; Ingleby, Cleveland, Yorkshire; Harlech Castle, Merioneth; Glanmire, Cork.

5. *A. monensis* Wheld. in Lanc. Nat. viii. 196, pl. 3 (1915).—Thallus greyish-white, thin, tartareous, pulverulent, or nearly obsolete, when it consists of a few granules round the base of the

perithecia. Perithecia scattered, black, nearly globose, very small, prominent, slightly immersed at the base or sessile, smooth; perithecial wall entire, black, brown internally; ostiole poriform; paraphyses numerous, slender, lax, distant; asci cylindrical, elongate, 99–120 μ long; spores uniseriate or partly bi-seriate, fusiform-ellipsoid, colourless, 1-septate, constricted at the septum, rather large, 20–33 μ long, 6–10 μ thick.—A. L. Sm. Monogr. i. 484 (1918). Specimen not seen.

Considered by Wheldon to be allied to *A. Salweii*, but distinct in the small perithecia and in the larger spores, which may have one cell larger than the other.

Hab. On mortar mixed with many fine quartz particles, on a wall in Glen Maye, I. of Man. (Collected by J. W. Hartley and J. A. Wheldon, June 1914. Wheldon's herbarium is now at Cardiff University.)

118. **ARTHOPYRENIA** Massal. Ric. Lich. 165 (1852); emend. Gen. Lich. 16 (1854); Muell. Arg. in Engl. Bot. Jahrb. vi. 376 (1885) (excl. *Acrocordia*). *Lejophlea* S. F. Gray Nat. Arr. i. 495 (1821) pro parte. *Verrucaria* subg. *Lejophlea* Ach. Lich. Univ. 274 (1810) pro parte. (Pl. 52.)

Thallus crustaceous, superficial or developed within the substratum. Perithecia simple, always dark-coloured, superficial or semi-immersed, globose or semi-globose; paraphyses persistent, branched and entangled, or sometimes mucilaginous and disappearing; asci somewhat elongate-ovate, 2–8-spored; spores ellipsoid or elongate, more or less constricted in the middle, 1- or more-septate, massed in the ascus, colourless. Spermatogones small, globose or ovoid, with simple sterigmata and rodlike spermatia.

Growing on trees; thallus usually light-coloured; spores 1-septate.

1. **A. epidermidis** Mudd Man. 303 (1861) (excl. vars. except var. *atomaria*) (non Massal.).—Thallus developed below the bark, forming greyish or brownish spots or little visible, smooth, effuse or determinate. Perithecia small, black, hemispherical, semi-immersed, becoming more or less prominent and shining, sometimes slightly spreading at the base; perithecial wall dimidiate; paraphyses present, more or less branched, entangled or disappearing; asci ovate-elongate; spores oblong or clavate-oblong, colourless, 1-septate, sometimes slightly constricted, the cells almost equal in length, sometimes with a mucilaginous coat (halonate), 15–24 μ long, 5–7 μ thick.—*A. nitescens* Mudd l. c.; *Verrucaria epidermidis* Fr. Lich. Eur. 447 (1831) pro parte (non Ach. *vide* Wainio in Helsingf. Faun. & Fl. Fenn. Meddel. x. 187 (1883)); Grev. Fl. Edin. 353? Hook. in Sm. Engl. Fl. v. 149 pro parte; Tayl. in Mackay Fl. Hib. ii. 88 pro parte; Leight. Angioc. Lich. 40, t. 17, fig. 3 (excl. var. *analepta*) & Lich. Fl. 431;

ed. 3, 463 (excl. vars.); Cromb. Lich. Brit. 119 (excl. vars. except var. *nitescens*). *V. nitescens* Salwey in Trans. Nat. Hist. Soc. Penzance, 1853, 140 (e descript.); Leight. Lich. Fl. 434; ed. 3, 467.

Exsicc. Carroll Lich. Hib. n. 31; Bohl. n. 63.

Confused with *Verrucaria epidermidis* Ach. (*Leptorhaphis*), which is wholly confined to birch bark and has different spores. The perithecia are always small and round in outline with the base immersed in the epidermis of the host. In this species, as also in *A. punctiformis*, the spores have been figured by Massalongo (Ric. Lich. 168 (1852)) as several-septate.

Hab. On the bark of birch and other trees.—*Distr.* Somewhat common in S. and N. England, and in S. and W. Ireland; Scotland? —*B. M.* Withiel and Bodmin, Cornwall; Torquay, Devon; Malley Wood, New Forest, Hants; Ulting, Sussex; Shere, Surrey; Cowcombe Wood, Kemble, near Cirencester and Chalford, Gloucestershire; Bath, Somerset; Capel Arthog, Merioneth; Builth, Breconshire; Trefriw and Bettws-y-Coed, Carnarvonshire; near Ayton, Cleveland, Yorkshire; Morrone, Braemar, Aberdeenshire; banks of the Garry, Inverness-shire; Riverstown, Castlemartyr, Carrigaloe, Glanmire and White Point Harbour, Cork; Torc Mt., Cloghan Mt. and Cromaglown, Killarney, Loch Inehiquin and Glencar, Kerry; Clonmel, Tipperary.

Var. *lactea* Mudd Man. 304 (1861) pro parte.—Thallus white or whitish, determinate, sometimes surrounded by a dark line. Perithecia moderate in size, spreading at the base, shining-black or partly covered by the thallus, otherwise as in the species.—*Verrucaria punctiformis* var. *lactea* Schær. Enum. 220 (1850) (non *V. stigmatella* var. *lactea* Ach. fide Muell. Arg. in Flora lxviii. 259 (1885)).

Exsicc. Mudd n. 294.

The perithecia are slightly more spreading at the base than in the species, in this character approaching *A. analepta*.

Hab. On the bark of trees, chiefly sycamore.—*Distr.* Rare in N. England.—*B. M.* Kildale, Cleveland, Yorkshire.

2. *A. punctiformis* Arn. in Flora liii. 485 (1870).—Thallus developed below the bark, forming copper-coloured or brownish patches, or the bark remaining unchanged. Perithecia minute, black, shining, convex or somewhat conical, semi-immersed or becoming almost superficial; perithecial wall dimidiate; asci small, pyriform or usually angular at the base with the stalk-cell at one side; usually 40–60 μ long, 14 μ thick, sometimes more swollen; paraphyses indistinct, mostly obsolete; spores oblong or oblong-ovoid, 1-septate, the cells almost equal, 14–17 μ long, 3–5 μ thick.—*A. epidermidis* var. *punctiformis* Mudd Man. 305 (1861); var. *atomaria* Mudd l. c. *Verrucaria punctiformis* Pers. in Ust. Ann. Bot. xi. 19 (1794) fide Arn. l. c.; Hook. in Sm. Engl. Fl. v. 150; Tayl. in Mackay Fl. Hib. ii. 88; Leight. Angioc. Lich. 41, t. 17, fig. 5 & Lich. Fl. 433; ed. 3, 466 (excl. ff. *tremulæ* and

elongatula). *V. epidermidis* var. *punctiformis* Nyl. Lich. Scand. 281 (1861) (non Schrank); Cromb. Lich. Brit. 119. *Lichen punctiformis* Ach. Lich. Succ. Prodr. 18 (1798); Engl. Bot. t. 2412. *L. atomarius* Ach. tom. cit. 16? *Lejophlea punctiformis* S. F. Gray Nat. Arr. i. 496 (1821).

Exsicc. Mudd n. 298 (as *A. epidermidis* var. *atomaria*; Leight. nos. 288 (as *Verrucaria epidermidis*), 344.

Differs from the preceding species in the smaller size of all the parts and in the obsolete paraphyses. Leighton includes in his f. *diminutula* (var. *deminutula* Nyl. in Flora li. 164 (1868)) forms with minute perithecia and larger spores, 16–22 μ long, 3–4 μ thick, but the specimen of f. *diminutula* in the herbarium, collected at the same time and place as Leighton's form (Torc Mt., Killarney), does not differ from the species, the spores are somewhat elongate and measure 17 μ long, 3–4 μ thick. Schrank's species, *Lichen punctiformis* (Baierische Flora ii, 513 (1789)), has a "hard farinose grey thallus" and grows on limestone rocks.

Hab. On the bark of various trees.—*Distr.* Not uncommon throughout the British Isles.—*B. M.* Hurstpierpoint, Sussex; Chedworth and Chalford, Gloucestershire; Bath, Somerset; Hay Forest, Herefordshire; Windeliff, Monmouth; Comberton Woods, Cambridgeshire; Hoggart's Wood, Ingleby, and Cliffrigg, Cleveland, Yorkshire; Barcaldine, Lorne, Argyll; White Point, Cork; Cloghan, Cromaglow, Dinish, Torc Mt. and Derrycunihy, Killarney and Glencar, Kerry; near Dublin.

3. *A. pyrenastrella* Norm. in Bot. Not. 1872, 38; Arn. in Flora lxviii. 161 (1885).—Thallus greyish or brownish, effuse, often indistinct. Perithecia black, minute, semi-immersed, roundish, solitary or in small groups confluent at the base; perithecial wall dimidiate; paraphyses indistinct, breaking up and disappearing; asci cylindrical or subventricose; spores colourless, cylindrical, clavate, 1-septate, the upper cell rather thicker, the lower cell longer, 15–25 μ long, 4–6 μ thick.—*Verrucaria epidermidis* var. *pyrenastrella* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 59 (1858). *V. punctiformis* f. *tremulæ* Leight. Lich. Fl. 434 (1871); ed. 3, 466, e descript. (*V. stigmatella* var. *tremulæ* Ach. Meth. 117 (1803)?). *V. submiserrima* Nyl. in Flora lx. 231 (1877), e descript.; Leight. Lich. Fl. ed. 3, 472.

Allied to *A. punctiformis*, but with smaller congregate perithecia and larger spores.

Hab. On the bark of trees.—*Distr.* Rare in S. England, W. Scotland and S.W. Ireland.—*B. M.* Sheffield Park and Nutley, Sussex; Barcaldine, Lorne, Argyll; Cloghan, Killarney, Kerry.

4. *A. cinereo-pruinosa* Koerb. Syst. Lich. Germ. 368 (1855).—Thallus greyish- or yellowish-white, effuse, very thin or obsolete. Perithecia hemispherical, more or less minute, innate at first and thinly covered by the thallus which gives them a pruinose appearance, sometimes emergent and shining black; perithecial wall

dimidiate; asci cylindrical-clavate, rarely obovate; paraphyses slender, often septate, numerous or scanty, sometimes breaking up; spores colourless, almost equally 1-septate, constricted in the middle, with usually a slighter constriction in each cell, 15–22 μ long, 5–7 μ thick.—*A. epidermidis* var. *cinereopruinosa* Mudd Man. 305 (1861) (incl. subvar. *galactites*) (*Verrucaria galactites* DC. Fl. Franc. ii. 315 (1805)?). *Verrucaria cinereopruinosa* Schær. Spicil. 343 (1833). *V. epidermidis* var. *cinereopruinosa* Garov. Tent. 84, t. 5, fig. 5 (1865); Leight. Lich. Fl. 432; ed. 3, 464.

Exsicc. Leight. n. 197; Mudd n. 297; Carroll Lich. Hib. n. 30; Larb. Lich. Hb. n. 279 (as *Verrucaria fallax*); Johns. n. 475.

Differs from *A. epidermidis* chiefly in the immersed perithecia, but also in the more elongate asci and more distinct paraphyses. The spores often have a distinct slight constriction or indentation in each cell.

Hab. On bark of trees.—*Distr.* Somewhat rare in S. and N. England and in S. and W. Ireland.—*B. M.* Torquay, Devon; near Crawley, Sussex; near Guiting and near Cirencester, Gloucestershire; Ingleby and Ayton, Cleveland, Yorkshire; Ashgill Alston, Cumberland; Inverary, Argyll; Castle Bernard Park, Bandon, Little Island and near Carrigaline, Cork; Kenmare, Kerry; near Clifden and Renvyle Wood, Connemara, Galway; Clare Island, Mayo.

Form *Hederæ* Arn. in Flora lxviii. 160 (1885).—Differs from the species in the somewhat more exposed and larger perithecia and in the more elongate asci; the spores show occasionally a second or third septum.—*Pyrenula punctiformis* var. *cinereopruinosa* form *Hederæ* Hepp Flecht. Eur. n. 105 (1853).

Hab. On ivy branches.—*Distr.* Rare in W. Ireland.—*B. M.* Killybeg, Clare.

5. *A. analepta* Massal. Ric. Lich. 165 (1852) emend. Koerb. Parerg. 389 (1865).—Thallus effuse, developed under the bark, which it colours light or dark-brown. Perithecia hemispherical, semi-immersed, spreading at the base, moderate in size, often ringed by a darker circle of the thallus; perithecial wall dimidiate; paraphyses rather confused and entangled or somewhat indistinct; asci clavate-oblong; spores colourless, ellipsoid or oblong, 1-septate, slightly constricted in the middle, 15–24 μ long, 6–8 μ thick or up to 30 $\mu \times$ 9 μ , sometimes narrower.—*A. epidermidis* var. *analepta* Mudd Man. 304 (1861) (incl. subvars. *Mespili*, *Coryli* and *acerini*). *Lichen analeptus* Ach. Lich. Suec. Prodr. 15 (1798)? *Verrucaria analepta* Ach. Meth. 119 (1803); Winch. Bot. Guide, 44 (1807). *V. epidermidis* var. *analepta* Hook. in Sm. Engl. Fl. v. 149 (1833)? Tayl. in Mackay Fl. Hib. ii. 88? Leight. Angioc. 40, t. 17, fig. 4 & Lich. Fl. 432; ed. 3, 463; Cromb. Lich. Brit. 119. *Lejophlea analepta* S. F. Gray Nat. Arr. i. 496 (1823).

Exsicc. Johns. n. 476; Leight. n. 29; Mudd nos. 293, 296 (as *A. epidermidis* var. *punctiformis*).

Easily distinguished from the preceding three species by the larger spreading perithecia, and usually by the darker thallus. Arnold (Flora lxviii. 159 (1868)) quotes Leight. *Ersicc.* n. 29 as *A. fallax*, but the specimen in the British Museum is *A. analepta*. The spores usually about $22\mu \times 7\mu$, may be much larger ($30\mu \times 10\mu$).

Hab. On the smooth bark of trees.—*Distr.* Not uncommon in England, rare in S.W. Ireland.—*B. M.* Lyndhurst, New Forest, Hants.; Hadleigh Woods, Mark's Hall, Ulting and Hoe Street, Essex; Haughmond Hill, Shropshire; Llandyssil, Cardiganshire; Bettws-y-Coed, Carnarvonshire; Newton Wood and Hoggart's Wood, Ingleby, Ayton and Cliffrigg, Cleveland, Yorkshire; Levens Park, Westmorland; Lamplugh, Cumberland; Cromaglow, Killarney.

6. *A. fallax* Arn. in Verh. K.K. Zool.-Bot. Ges. xxiii. 505 (1873) (excl. syn.) & in Flora lxviii. 159 (1885).—Thallus effuse, developed under the bark which it colours light or dark-brown. Perithecia moderate in size, hemispherical, semi-immersed, spreading at the base, often ringed by a darker circle of the thallus; perithecial wall dimidiate; paraphyses distinct, few or numerous, free; asci clavate-oblong: spores colourless, ellipsoid or oblong, 1-septate, slightly constricted in the middle, the lower cell usually smaller, $16-24\mu$ long, $6-9\mu$ thick, spermatogones with rod-like spermatia, 10μ long, 1μ thick.—*A. epidermidis* var. *fallax* Mudd Man. 303, t. 5, fig. 126 (1861). *Lichen analeptus* Sm. Engl. Bot. t. 1848 (1808). *Verrucaria epidermidis* var. *fallax* Nyl. in Bot. Not. 1852, 178; var. *analepta* f. *fallax* Cromb. Lich. Brit. 119 (1870); Leight. Lich. Fl. 432; ed. 3, 464. *V. analeptella* Nyl. in Flora lv. 363 (1872) e descript.; Leight. Lich. Fl. ed. 3, 464.

Ersicc. Bohl. n. 66 (as *Verrucaria cinerea*); Johns. n. 477; Mudd n. 292.

Characterized by the distinct paraphyses, but in form and appearance very similar to the preceding, of which it may be only a variety or growth form. *V. analeptella* has been included here, as Nylander says it differs from *V. analepta* only in the possession of distinct paraphyses; there is no specimen of it at the British Museum. Nylander (*l. c.*) gives *Sagedia anca* in Anzi Lich. Min. rar. n. 395 as a synonym, but that plant has been identified by him in MS. as *Verrucaria grisea*.

Hab. On the smooth bark of trees.—*Distr.* Common throughout England, rare in Scotland and S.W. Ireland.—*B. M.* Newlyn Cliff, Cornwall; Torquay and Lustleigh Cleeve, Devon; Buckland and Castle Nerocke, Somerset; Pease Cottage Gate, New Timber Wood, Hayward's Heath and St. Leonard's Forest, Sussex; Writtle, Essex; Cradley, Herefordshire; Savernake, Wilts; Chedworth, Gloucestershire; near Malvern, Worcestershire; Nesscliff, Shropshire; Harlech, Merioneth; Denbigh; Ayton, Ingleby and Hob Hole, Cleveland, Yorkshire; Bettws-y-Coed and Trefriw, Carnarvonshire; Staveley, Westmorland; Ashgill Alston, Cumberland; near Perth; Altnaharra, Sutherland; near Macroom and Muckcross, Cork; Cloghan and Kenmare, Kerry; Castlebar, Mayo.

7. **A. stigmatella** A. L. Sm. (non Massal.).—Thallus smooth, greyish or brownish, effuse, thin. Perithecia black, small, varying in size, often a mere point, semi-immersed and hemispherical or more emergent and somewhat convex; perithecial wall dimidiate; paraphyses usually indistinct; asci, elongate-elliptical; spores colourless, elongate-oblong, usually tapering at one or both ends, often becoming brownish, large, 1-septate, 27–40 μ long, 7–10 μ thick.—*Lichen stigmatellus* Sm. Engl. Bot. t. 1891 (1808) (non Ach.). *Lejophlea stigmatella* S. F. Gray Nat. Arr. i. 496 (1823). *Verrucaria cinerea* Hook. in Sm. Engl. Fl. 149 (1833) (non Pers. in Ust. Ann. vii. 28, t. 3, fig. 6A (1794)); Tayl. in Mackay Fl. Hib. ii. 88; Leight. Angioc. Lich. 39, t. 17, fig. 2 & Lich. Fl. 433; ed. 3, 464. *V. antecellens* Nyl. in Flora xlix. 86 (1866); Carroll in Journ. Bot. v. 260 (1867); Cromb. Brit. Lich. 119; Leight. Lich. Fl. 435; ed. 3, 465 & in Grevillea i. 60, t. 4, fig. 2. *V. epidermidis* var. *cinerea* Mudd Man. 304 (1861); Cromb. Lich. Brit. 119.

Exsicc. Leight. n. 343; Mudd n. 295 (both specimens imperfectly developed); Carroll Lich. Hib. n. 32.

Easily recognized by the large 1-septate spores, and usually by the mixture of larger and smaller perithecia and spermogones dotted over the thallus. In the absence of authentic information as to *Lichen stigmatellus* Ach., the specimen in Sowerby's herbarium has been taken as the type. *Verrucaria antecellens* (authentic specimen in Davies' herbarium) agrees with *A. stigmatellus* in outward and internal characters. The thallus is perhaps less grey than in our specimens of *Verrucaria cinerea*; that species is also otherwise identical.

Hab. On the bark of trees, chiefly holly.—*Distr.* Not uncommon in S. England. Rare in N. England, Wales and Scotland, common in S. and W. Ireland.—*B. M.* Withiel and St. Breock, Cornwall; Ivy Bridge, Devon; Lyndhurst, New Forest, Hants; Pease Pottage Gate, Tilgate and St. Leonard's Forest, Sussex; Shere, Surrey; Leekhampton, Gloucestershire; Dolgelly, Merioneth; Bettws-y-Coed, Carnarvonshire; Ingleby, Newton and Kildale, Cleveland, Yorkshire; Loch Lomond, Dumbartonshire; Glenbower, Glanmire, Crosshaven, Castle Bernard and Castlemartyr, Cork; Cloghan, Tore Mt., Cromaglow, Loch Inchiquin, Dinish, Killarney, Old Dromore and Glencar, Kerry; Loughcooter, Galway.

8. **A. analeptoides** A. L. Sm.—Thallus whitish-grey, thin, effuse. Perithecia black, moderate in size, hemispherical, semi-immersed and slightly spreading at the base, or small, emergent and subglobose; perithecial wall dimidiate; paraphyses numerous, septate, lax or coherent; asci ventricose-elongate; spores elongate, fusiform-clavate, 1-septate, the cells with several guttulæ and spuriously 3–5-septate, colourless or slightly tinged yellowish, 23–37 μ long, 6–7 μ thick.—*Verrucaria analeptoides* Nyl. in Flora l. 180 (1867) (non Bagl. & Carest.). *V. analeptiza* Nyl. in *op. cit.* lvi. 300 (1873); Leight. Lich. Fl. ed. 3, 464. *V. antecellens* var. *analeptoides* Cromb. Lich. Brit. 119 (1870); Leight. Lich. Fl. 435. *V.*

elongatula Nyl. in Flora li. 164 (1868). *V. punctiformis* f. *elongatula* Leight. Lich. Fl. 434; ed. 3, 466; Cromb. Lich. Brit. 120.

Not to be confused with *A. submicans*, the spores of which are 4-guttulate but finally 3-septate. It differs from *A. stigmatella*, with which it has been associated, in the greyer more superficial thallus, in the narrower guttulate spores which are massed in the ascus and in the presence of paraphyses. Nylander gives the size of the spores at 36–50 μ long, 7–10 μ thick, but these measurements are not borne out by an examination of Carroll's specimens.

Hab. On bark of trees.—*Distr.* Rare in S.W. Ireland.—*B. M.* Dinish and Torc Mt., Killarney, Kerry; Loughcooter, Galway.

9. *A. byssacea* A. L. Sm.—Thallus filmy, whitish, thin, effuse. Perithecia minute, black, globose, semi-immersed; perithecial wall curving inward, dimidiate; paraphyses numerous, branched, free; asci elongate-clavate, about 70 μ long, 17 μ wide; spores 8 in the ascus, fusiform, 1-septate(?), colourless, 15 μ long, 4 μ thick.—*Verrucaria byssacea* Tayl. in Mackay Fl. Hib. ii. 89 (1836) (non Ach. fide Leight. Angioc. Lich. 38).

Leighton suggests (*l. c.*) that Taylor's species is identical with *Acrocordia biformis*, but the minute perithecia and the structure of asci and spores are entirely distinct. There is only one small specimen in the herbarium of the British Museum collected by Dr. Taylor; the spores are somewhat imperfectly developed, but so far as can be determined they are 1-septate.

Hab. On barks of trees, oak and elm.—*B. M.* Presumably Kerry. (*Ex* Herb. Salwey.)

Growing on trees; thallus dark-coloured; spores 1-septate.

10. *A. Laburni* Arn. in Flora xlv. 537 (1861); Sydow Flecht. Deutschl. 295 (1887).—Thallus thin, smooth, brown or brownish-black, forming dark spots on the bark. Perithecia minute, hemispherical, semi-immersed, black and shining; perithecial wall dimidiate; paraphyses indistinct, disappearing; asci rather swollen, narrower upwards; spores oblong-linear, 1-septate, scarcely constricted, the cells almost equal, sometimes with two or more guttulæ; 20–25 μ long, 4–5 μ thick; hymenial gelatine yellow with iodine.—*A. Fumago* Mudd Man. 302 (1861) (non Koerb. Syst. Lich. Germ. 370 (1855)). *Verrucaria Laburni* Leight. Lich. Fl. 435 (1871); ed. 3, 465.

Exsicc. Leight. n. 254; Mudd n. 291.

Easily confused with *A. rhyponia*; it differs in the narrower, 2-celled spores.

Hab. On laburnum and other trees.—*Distr.* Rare throughout the British Isles.—*B. M.* Near Whitestaunton, Somerset; Cirencester, Gloucestershire; Ayton, Cleveland, Yorkshire; Trefriw, Carnarvonshire; Aberfeldy, Perthshire.

11. **A. microspila** Koerb. Parerg. Lich. 392 (1865).—Thallus forming dull black filmy or roughish spots on the bark. Perithecia minute, black, prominent, hemispherical, slightly papillose above; perithecial wall entire with a thin wall under the base; paraphyses indistinct or disappearing; spores colourless, linear-oblong, 1-septate, rather small, 13–17 μ long, 3–5 μ thick, or sometimes a little longer.—*A. rhyponia* Mudd Man. 303 (1861) (non Massal.). *Verrucaria rhyponia* Borr. in Engl. Bot. Suppl. n. 2597, fig. 2 (1829) (non Ach.); Hook. in Sm. Engl. Fl. v. 150 (excl. syn. Ach.); Tayl. in Mackay Fl. Hib. ii. 89; Leight. Angioc. Lich. 37, t. 16, fig. 1; var. *rhyponiella* Nyl. in Flora l. 374 (1867); Cromb. Lich. Brit. 120. *V. capnodes* Nyl. in Flora l. 330 (1867); Carroll in Journ. Bot. v. 259 (1867); Lindsay in Quart. Journ. Microsc. Sci. ix. 351 (1869); Cromb. Lich. Brit. 120; Leight. Lich. Fl. 438; ed. 3, 468; var. *rhyponiella* Leight. Lich. Fl. 439 (1871); ed. 3, 468.

The brown coloration is due partly or wholly to a brown fungus mycelium. Confused with *A. rhyponia*, but differs in the more felted thallus, the form and size of the spores and the habitat, it being often found growing on the thallus of *Graphis* sp. It has been classified by Vouaux and others as a fungus. *Pharcidia microspila* Wint. (Bull. Soc. Mycol. Fr. xxviii. 247 (1912)). It is, however, a lichenoid species.

Hab. On bark, associated with, or growing over, *Graphis* sp.—*Distr.* Rare in S. and N. England and S. Ireland.—*B. M.* Sussex; Castle Bernard Park, Cork; Armagh; Castlebar, Mayo.

12. **A. Taylora** Mudd Man. 302 (1861).—Thallus dark-brown, thin, forming irregular determinate spots. Perithecia black, minute, numerous, globose-conical, immersed at the base, the ostiole minutely papillate; perithecial wall entire, black; paraphyses free, slender; asci elongate-clavate; spores colourless, fusiform, 1-septate, constricted, the cells usually with two or more guttulæ, 25–30 μ long, 4–5 μ thick; hymenial gelatine yellow, the spores brown with iodine.—*Verrucaria Taylora* Carroll ex Nyl. in Maine et Loire Mém. Soc. Acad. iv. 82 (1858); Cromb. Lich. Brit. 120; Leight. Lich. Fl. 438; ed. 3, 467.

Exsicc. Carroll Lich. Hib. n. 29.

Hab. On trees, chiefly ash or oak.—*Distr.* Rare in S.W. England. Not uncommon in S. and S.W. Ireland.—*B. M.* Torquay, Devon; Glenbower Wood, Dunscombes Wood, Castle Bernard Park and Rostellan, Cork; Dinish, Killarney and Valentia Island, Kerry; Clare Glen, Tipperary.

13. **A. aphorisasa** A. L. Sm.—Thallus indicated by brownish-black detached well-defined spots. Perithecia black, almost innate and hemispherical, many being congregated in each spot; perithecial wall dimidiate; paraphyses numerous, branching, indistinct; spores 4 to 8 in the ascus, colourless, at length brown, oblong, 1-septate, 20–28 μ long, 5–7 μ thick; hymenial gelatine

tinted blue or violet with iodine.—*Verrucaria aphorisasa* Stirton in Grevillea iii. 36 (1874); Leight. Lich. Fl. ed. 3, 467.

Hab. On bark of elm at Grantown, Elgin.

Growing on rocks, sand or soil (or on mosses); spores
1-(rarely 3-)septate.

14. *A. saxicola* Massal. Symm. Lich. 107 (1855).—Thallus whitish or bluish-grey, thin, effuse or in patches, pulverulent. Perithecia minute, black, shining, semi-immersed; paraphyses mucilaginous, indistinct; spores colourless, oblong-elongate, 1-3-septate, slightly constricted, colourless, 20-21 μ long, 5 μ thick; hymenial gelatine yellow with iodine.—*Verrucaria saxicola* Cromb. in Journ. Bot. xiv. 362 (1876)? Leight. Lich. Fl. ed. 3, 461.

Distinguished by the blue-grey thallus and by the extremely minute perithecia, which are comparable with those of *Microthelia dispersa*. Continental lichenologists describe the spores as normally 4-celled. Examination of specimens shows that they are sometimes 2-celled, sometimes 4-celled.

Hab. On calcareous rocks.—*Distr.* Rare in W. England and N. Wales.—*B.M.* Duntisbourne, Gloucestershire; Minera near Wrexham, Denbighshire.

15. *A. spilobola* A. L. Sm.—Thallus black, thin, evanescent. Perithecia black, small, somewhat prominent, crowded or aggregate; perithecial wall entire; paraphyses indistinct; asci oblong-ovate; spores colourless, oblong-ovate, 1-septate, 15-20 μ long, 5-8 μ thick; hymenial gelatine not tinged with iodine.—*Verrucaria spilobola* Nyl. in Flora iv. 363 (1872); Leight. Lich. Fl. ed. 3, 469.

Nylander states that the gonidia are green and often 4-connate. In the Craig Tulloch specimen the gonidia are cells of *Trentopodia*.

Hab. On rocks.—*B. M.* Keswick, Cumberland; Craig Tulloch, Perth.

16. *A. argilospila* A. L. Sm. Monogr. Lich. i. 485 (1918).—Thallus gelatinous when wet, dusky-olive-green, evanescent when dry. Perithecia black, hemispherical, semi-immersed, ostiole slightly depressed with a minute pore; perithecial wall entire; paraphyses slender, branched; spores colourless, oblong-ovoid, 1-septate, the cells granular, lower cell somewhat tapering, 21-22 μ long, 8 μ thick; asci and spores pale-brownish with iodine.—*A. arenicola* A. L. Sm. Monogr. Lich. ii. 323 (1911). *Verrucaria argilospila* Nyl. in Flora lvii. 15 (1874). *V. arenicola* Leight. Lich. Fl. ed. 3, 470 (1879). *Magnopsis argilospila* Nyl. ex Cromb. in Grevillea xv. 10 (1886) & Monogr. Brit. Lich. 30.

The thallus forms a thin layer over the sand; the dark, mucilaginous character is evidently due to the presence of surface blue-green algæ, hence the classification by Nylander as a genus of *Phycolichens*.

Hab. On wet sand-banks.—*B. M.* Shelton Rough near Shrewsbury, Shropshire (the only locality).

17. **A. areniseda** A. L. Sm. in Journ. Bot. xlix. 42 (1911).—Thallus ashy- or whitish-grey, continuous, granular, following the inequalities of the substratum, somewhat furfuraceous. Perithecia very minute, black, semi-immersed, the upper part conical, opening by a rather wide ostiole; perithecial wall thin entire; paraphyses numerous, slender, branched; asci elongate, slightly narrowed at each end, about $140\ \mu$ long, $25\ \mu$ thick; spores usually 8 in the ascus, elongate-clavate, the upper cell broader, sometimes with large guttulæ, colourless, 1-septate, large, $32\text{--}37\ \mu$ long, $10\ \mu$ thick; hymenial gelatine yellow, the asci orange or brick-red, with iodine.

The scanty algal symbiont is *Trentepohlia*, and has the deep yellow colour of the gonidia of many of the maritime species. The spores resemble somewhat those of *A. epidermidis*, but they are much larger. The specimens were collected by J. A. Wheldon.

Hab. On damp sandy shore.—*B. M.* Formby and near Southport, Lancashire; Hoylake, Cheshire.

18. **A. lomnitzensis** Stein ex Cohn Krypt.—Flora Schlesien ii, 2, 343 (1879); Steiner in Oesterr. Bot. Zeitsch. lxiii. 336 (1913).—Thallus spreading or in spots, thin, smooth, continuous, or in parts slightly cracked, dark-olivaceous-brown, hypothallus indistinct. Perithecia minute, up to $150\ \mu$ diam. black, subglobose, sessile, with a minute pore; paraphyses not present; asci clavate about $32\text{--}40\ \mu$ long, $13\ \mu$ wide; spores 8 in the ascus, colourless, clavate-ellipsoid, 1-septate, $9\text{--}13\ \mu$ long, $4.5\text{--}6\ \mu$ thick; asci and spores brick-red or yellow with iodine.

The specimen collected by H. H. Knight in May 1924 agrees in all particulars with the above plant from Silesia, except that the thallus is perhaps darker, almost blackish in places. This seems to be the second record of the lichen.

Hab. On submerged siliceous rocks.—*B. M.* In river Dove, Dovedale, Derbyshire.

19. **A. bryospila** Arn. in Flora liii. 484 (1870).—Thallus dark-brownish-black, thin. Perithecia black, minute, prominent, subconical; ostiole poriform; perithecial wall entire; paraphyses distinct, slender, branched; asci oblong, slightly narrower upwards; spores usually 8 in the ascus, sometimes 4 or 2, colourless, 1-septate, $27\text{--}44\ \mu$ long, $8\text{--}12\ \mu$ thick; hymenial gelatine not tinged with iodine.—*Verrucaria bryospila* Nyl. in Flora xlvii. 357 (1864); Carroll in Journ. Bot. iii. 293 (1865); Cromb. Lich. Brit. 120; Leight. Lich. Fl. 438; ed. 3, 470.

The British specimens are intermixed and somewhat over-grown by *Dermatocarpon cinereum*. There are 8 spores in the ascus, some of them of rather smaller size than those of the original Norwegian plant.

Hab. On mosses and schistose soil.—*B. M.* Ben Lawers, Perthshire (only British locality).

Parasitic and doubtful species ; spores 1-septate.

20. **A. allogena** Arn. in Flora liii. 484 (1870).—Thallus wanting. Perithecia black, hemispherical; perithecial wall dimidiate; paraphyses indistinct; spores oblong or slightly clavate-oblong, colourless, 1-septate, one cell slightly thicker, 23–37 μ long, 7–9 μ thick.—*Verrucaria allogena* Nyl. in Flora xlviii. 357 (1865); Leight. Lich. Fl. 461; ed. 3, 492. *V. epidermidis* var. *allogena* Carroll in Journ. Bot. iv. 25 (1866); Cromb. Lich. Brit. 120.

Retained in this genus on account of the dimidiate apothecium, a strongly lichenological character. The spores are very like those of *A. epidermidis*, of which Nylander thought it might possibly be a variety.

Hab. Parasitic on the thallus of *Rhizocarpon petraeum* var. *excentricum*.—*B. M.* Ben Lawers, Perthshire (the only locality).

21. **A. (?) colleta** A. L. Sm.—Thallus black, thin, continuous. Perithecia black, small, diameter .1–.2 mm. in diameter, spherical at times almost aggregate; perithecial wall entire; spores 8 in the ascus, colourless, fusiform, often constricted at the middle, 1-septate, large, 32–45 μ long, 10–13 μ thick; paraphyses very indistinct; hymenial gelatine within the asci wine-red with iodine, the rest untinted.—*Verrucaria colletta* Stirton in Grevillea iii. 37 (1874); Leight. Lich. Fl. ed. 3, 468. Specimen not seen.

Stirton states that the "gonidia are seen interspersed, having, in many instances, a diameter from 16–20 μ , but it is questionable whether they belong to the thallus of this lichen." An aberrant species, possibly a pyrenomycetous fungus.

Hab. On *Gymnomitrium concinnatum* on Ben Lawers.

*Maritime species growing on rocks by the sea ; spores
1- (rarely 3-) septate.*

22. **A. littoralis** B. de Lesd. in Bull. Soc. Bot. France liii. 585 (1906).—Thallus evanescent. Perithecia minute, black, scattered, prominent, or semi-immersed; perithecial wall thick, subentire; paraphyses rather scanty, distinct; asci cylindrical or slightly swollen in the middle; spores oblong-ovate, colourless, 1-septate, the upper cell sometimes thicker, 12–19 μ long or longer (up to 24 μ), 5–7 μ thick; hymenial gelatine brown with iodine.—*Verrucaria littoralis* Tayl. ex Leight. Angioc. Lich. 46, t. 20, fig. 2 (1851), & Lich. Fl. 440; ed. 3, 470 (non *V. littoralis* Tayl. in Hook. Journ. Bot. vi. 154 (1847)); Carroll in Journ. Bot. iii. 293 (1865); Cromb. Lich. Brit. 120. *V. consequens* Nyl. in Flora xlvii. 357 (1864) (*vide* Wedd. in Mém. Soc. Sci. Nat. Cherb. xix. 306 (1875)); Jones in Proc. Nat. Hist. Soc. Dublin iv. i. 149 (1864). *V. sublittoralis* Leight. Lich. Fl. 435 (1871); ed. 3, 461.

Arnold has published *Arthopyrenia littoralis* in Ber. Bayr. Bot. Ges. i. Anhang 120 (1891), based on *Verrucaria littoralis* Tayl. which

is doubtfully identical with *Verrucaria microspora*. There is no record of a specific name "*littoralis*" in Taylor's Fl. Hib. 91-92, as quoted by Arnold; the species there recorded *V. muralis* is, however, quoted by Leighton under *V. littoralis*.

Hab. On shells or on rocks by the sea.—*Distr.* Rare in S. England, Wales and S.E. and N. Ireland.—*B. M.* Penzance, Cornwall; between Seaton and Beer and Mudstone Bay, Brixham, Devon; Goodwick Bay, Fishguard, Manorbier and Tenby, Pembrokeshire; Robin Hood's Bay, Yorkshire; Ballinahassig, Cork; Glenarm, Antrim.

23. **A. foveolata** A. L. Sm. in Journ. Bot. xlix. 43 (1911).—Thallus thin, faintly yellowish-green or evanescent. Perithecia minute, black, almost completely immersed, leaving distinct small pits in the substratum; perithecial wall subentire, black above, brown below; paraphyses very scanty or wanting, not mucilaginous; asci cylindrical-clavate, 70-80 μ long, 17 μ thick, 8-spored; spores 1-septate, colourless, oblong-ovate, thinner at the ends, 15-18 μ long, 6-7 μ thick.

Very near the preceding species in habitat and form of spores, but differing in size and degree of immersion of perithecia and in the less distinct paraphyses.

Hab. On shells by the sea-shore.—*B. M.* Plymouth, Devon; Robin Hood's Bay, Yorkshire (collected by Mr. E. M. Holmes).

24. **A. leptotera** Arn. in Flora liii. 485 (1870).—Thallus dark-olivaceous-green, somewhat gelatinous, smooth or cracked in drying, subdeterminate. Perithecia black, minute, subinnate; perithecial wall dimidiate; paraphyses breaking up or obsolete; asci oblong, ovate; spores oblong-clavate, 1-septate, the upper cell rather thicker, colourless, 16-18 μ long, 5 μ thick.—*Verrucaria leptotera* Nyl. in Flora xlviii. 212 (1865).

Distinguished from *A. littoralis* by the subgelatinous thallus and immersed apothecia. M. C. Knowles in Sci. Proc. Roy. Dublin Soc. xiv. 140 (1913) notes the minute dimidiate perithecia thickly scattered on the surface, and the narrow spores of an almost uniform width, in the species found by her associated with *Verrucaria aquatilis* on rocks over which fresh water frequently flows; she records it also on rocks associated with *Lichina pygmaea* and *Verrucaria striatula*.

Hab. On maritime rocks with a fairly wide range.—*Distr.* Rare in the Channel Islands, S. England and E. Ireland.—*B. M.* Grève-aux-Lançon, Jersey; Mudstone Bay, Devon; Clevedon, Somerset; Talsarnau, Merioneth; Lough Gill, Sligo.

25. **A. halodytes** Arn. Lichenenflora München in Ber. Bayr. Bot. Ges. i. Anhang 1891, 121; Oliv. Exp. Syst. Lich. France ii. 2, 261 (1901).—Thallus olivaceous-brown or blackish, thin, continuous or sparsely cracked, somewhat gelatinous. Perithecia very small, black, slightly prominent, becoming impressed above, numerous and somewhat congregate, intermixed with spermatogones; perithecial wall dimidiate; paraphyses few, slender,

irregular; asci inflated or elongate thickened above; spores oblong, 1-septate, slightly thicker at one end, 13–15 μ long, 5–7 μ thick or larger. *Verrucaria halodytes* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 142 (1857). *V. fluctigena* Nyl. in Flora Iviii. 14 (1875) (*fide* Weddell in Mém. Soc. Sci. Nat. Cherb. xix. 307 (1875)); Leight. Lich. Fl. ed. 3, 462.

Differs from the preceding in the more prominent perithecia and in the asci and spores. B. de Lesdain (Lich. Dunk. 252) gives unusual spore-sizes as 17–24 $\mu \times 7$ –12 μ . In the specimen from Watchet, Watson records 14–18 $\mu \times 5$ –7 μ . Nylander's specimen from Cherbourg is olivaceous-green in colour. Weddell (*l. c.*) describes the thallus as brown or brownish-black; he also adds a note on the algal symbiont, which, according to Bornet, is *Glaucapsa crepidinum* Thur., one of the Phycocromophyceæ. *V. fluctigena* has been referred by A. Zahlbruckner (Krypt. exsicc. n. 469) to *A. Kelpii* Koerb. (Parerg. Lich. 387 (1868)), which is synonymous with *A. halodytes*.

Hab. On maritime rocks, washed by the waves.—Specimen cited by Leighton (*l. c.*) (under *V. fluctigena*) as from Crombie, but not found in Herb. Crombie.—*B. M.* Watchet, Somerset.

Form *tenuicola* Knowles in Sci. Proc. Roy. Dublin Soc. xiv. 140 (1913).—Thallus very thin, brownish-hyaline. Perithecia rather smaller than in the species (*ca.* 1.5–2 μ wide).—*A. littoralis* var. *halodytes* subvar. *tenuicola* Wedd. in Mém. Soc. Sci. Nat. Cherb. xix. 307 (1875).

Hab. On smooth quartzites with the species, Howth, Dublin.

Var. *Hollii* A. L. Sm. in Journ. Bot. xlix. 43 (1911).—Thallus dull-black, widely spreading, very minutely cracked-areolate. Perithecia as in the species.

The minute areolation, visible only with a high magnification, gives the thallus a somewhat scabrid look. The original specimen was collected by H. B. Holl.

Hab. On rocks near the sea.—*Distr.* Rare in Western Counties.—*B. M.* Dawpool, Cheshire; on the road between Barmouth and Dolgelly, Merioneth.

26. *A. halizoa* Arn. Lichenflora München in Ber. Bayr. Bot. Ges. i. Anhang 1891, 121.—Thallus thin, effuse, continuous, pale-olivaceous or sage-green. Perithecia minute, black, scattered, prominent or semi-immersed; perithecial wall dimidiate or subentire; paraphyses scanty, distinct; asci cylindrical or slightly swollen; spores oblong-ovate, colourless, 1-septate, the upper cell sometimes larger, 10–13 μ long, 5–7 μ thick; hymenial gelatine yellow with iodine.—A. L. Sm. Monogr. Lich. ii. 326 (1911). *Verrucaria halizoa* Leight. Lich. Fl. 436 (1871); ed. 3, 461.

Very near to *A. leptotera* but differs in the thinner lighter-coloured thallus, distinct paraphyses, and smaller spores.

Hab. On maritime rocks.—*Distr.* Rare on the coast of S.W. England and Wales, and E. Scotland.—*B. M.* Manorbier Bay, North Cliff and Giltar Points, Tenby, Pembrokeshire.

27. *A. viridula* A. L. Sm.—Thallus effuse, thin, greenish-olive, tartareous, smooth or slightly cracked. Perithecia immersed, hemispherical, emerging, the ostiole umbilicate; perithecial wall dimidiate, spreading and incurved at the base; spores colourless, linear-oblong, 1-septate, 17–19 μ long, 6–7 μ thick.—*Lichen viridulus* Sm. Engl. Bot. t. 2455 (1812) pro parte and under t. 2623, f. 2, text. *Verrucaria elæina* Borr. in Sm. Engl. Bot. under t. 2455, fig. 2 (1812); Hook. in Sm. Engl. Fl. v. 152 pro parte; Leight. Angioc. Lich. 63, t. 27, fig. 2 & Lich. Fl. 436; ed. 3, 462. *Thelidium elæinum* Mudd Man. 296 (1861). Specimen not seen.

Perhaps identical with *A. halizoa*, to which the drawing in English Botany bears a strong resemblance.

Hab. On maritime slaty rocks.—*Distr.* Rare on the W. coast of Wales and W. Ireland.

28. *A. marina* A. L. Sm.—Thallus dark-olive-green, subgelatinous, smooth, determinate, with a black line at the circumference. Perithecia minute, black, immersed in the thallus, the ostiole rather flat or slightly depressed; perithecial wall entire, black; paraphyses none; spores 8 in the ascus, minute, ellipsoid-oblong, colourless, 1-septate, becoming 3-septate at maturity, 9–14 μ long, 3–5 μ thick.—*Sagedia marina* Deakin in Ann. & Mag. Nat. Hist. ser. 2, xiii. 40, t. 4, fig. 13 (1854). *Verrucaria marina* Leight. Lich. Fl. 446 (1871); ed. 3, 477; Masee in Journ. Bot. xxx. 193, t. 324, fig. 8 (1892).

Similar to *A. leptotera* in appearance of thallus and perithecia, but differing in the structure and size of the spores. Weddell's *Verrucaria leptotera* var. *marmorans* (Mém. Soc. Sci. Nat. Cherb. xix. 309 (1875)) is probably identical with *A. marina*.

Hab. On maritime rocks below high tide.—*Distr.* Rare in the Channel Islands, S. England and E. and W. Scotland.—*B. M.* Grève-au-Lançon, Jersey; Torquay, Devon.

Growing on trees; spores 3-septate.

29. *A. rhyponia* Massal. Ric. Lich. 166 (1852).—Thallus thin, subeffuse, dark-brown or blackish, forming dark-coloured spots on the bark. Perithecia minute, hemispherical, semi-immersed, black; perithecial wall dimidiate; paraphyses almost obsolete; spores colourless or becoming slightly brownish, linear-oblong, 3-septate, 18–22 μ long, 4–5 μ thick; hymenial gelatine red or yellow-brown with iodine.—*Verrucaria rhyponia* Ach. Lich. Univ. 282 (1810); Cromb. Lich. Brit. 120; Leight. Lich. Fl. 441; ed. 3, 471.

Often confused with *A. microspila*, owing to the dark-coloured thallus which in both occurs in rather small patches.

Hab. On bark of trees.—*Distr.* Very rare throughout the British Isles.—*B. M.* Curland near Taunton, Somerset; St. Leonard's Forest, Sussex; Airyholm, Cleveland, Yorkshire; Killin, Perthshire.

30. *A. Cerasi* Massal. Ric. Lich. 167 (1852).—Thallus greyish or brownish, thin, more or less shining, subdeterminate. Perithecia very small, more or less elliptical, numerous, black, shining; perithecial wall dimidiate; paraphyses breaking up, entangled upwards, often becoming almost obsolete; spores colourless, elongate-oblong, generally rather narrow, blunt at the ends, 3-septate, 15–25 μ long, 4–8 μ thick.—*Verrucaria Cerasi* Ach. Meth. 119 (1803); Leight. Lich. Fl. 441; ed. 3, 471.

Distinguished by the shining thallus and the elliptical perithecia, a character that is sometimes rather obscure. The spores in the Somerset specimen are for a long time 1-septate.

Hab. On the bark of cherry and other trees.—*Distr.* Rare in S. and S.W. England.—*B. M.* Castle Neroche, near Taunton, Somerset; Hurstpierpoint, Sussex.

31. *A. grisea* Koerb. Syst. Lich. Germ. 369 (1855).—Thallus effuse, thin, yellowish- or reddish-brown, rather shining. Perithecia scattered, minute (·35 mm. diam.), hemispherical, immersed, the small poriform ostiole emerging; perithecial wall dimidiate; asci obovoid-cylindrical, about 55 μ long, 17–20 μ wide; paraphyses few, stoutish, entangled; spores 8 in the ascus, oblong-clavate, 1- then 3-septate, round at the ends, almost breaking up into halves, 20–22 μ long or rather longer, 5–6 μ thick. *A. Crombici* A. L. Sm. in Journ. Bot. xlix. 43 (1911) & Monogr. Lich. ii. 328 (1911); *Verrucaria epidermidis* var. *grisea* Schleich. ex Schær. Spicil. 56 (1826).

Differs from *A. submicans* in the form of the spores and the presence of paraphyses. Owing to a misunderstanding of the spores of *Verrucaria grisea*, the above was described as a new species, *A. Crombici*.

Hab. On bark of trees (alder).—*B. M.* Banks of the Garry, Blair Athole, Perthshire.

32. *A. submicans* Arn. in Verh. K.K. Zool.-Bot. Ges. xxiii. 530 (1873).—Thallus yellowish or pale-reddish-brown, thin, effuse. Perithecia numerous, small, hemispherical, shining, black, the ostiole minutely poriform; perithecial wall dimidiate; paraphyses very scanty or none; asci obelavate, rather short; spores 8 in the ascus, linear-oblong or slightly clavate, 4-guttulate, 1- then 3-septate, colourless, sometimes becoming brownish, 16–25 μ long, 4–6 μ thick.—*Verrucaria submicans* Nyl. in Flora lv. 363 (1872); emend. Leight. Lich. Fl. ed. 3, 471 (1879).

The spores originally described by Nylander as 2-celled only,

remain so for a long time, the presence of the large guttulæ also tends to obscure the additional septa.

Hab. On smooth trees.—*Distr.* Rare in S. and N. England, Wales, W. Scotland and Ireland.—*B. M.* Bosnieves, Cornwall; Lyndhurst, New Forest, Hants; Torquay, Devon; Capel Curig, Carnarvonshire; Ingleby and Westerdale, Cleveland, Yorkshire; Arrochar, Dumbartonshire; near Muckcross, Killarney and Dromore, Kerry; Saintfield, Down.

Growing on trees; spores 3–7-septate.

33. **A. platypyrenia** Arn. in Flora liii. 485 (1870).—Thallus effuse, thin, faintly brownish-yellow. Perithecia black, immersed at first, hemispherical-depressed, the ostiole a very minute pore; perithecial wall dimidiate; paraphyses branched, soft and irregular or indistinct; spores ellipsoid-oblong, 3–5-septate (rarely 7-septate), the central cells largest, colourless, sometimes becoming smoky-brown when old, 23–30 μ long, 9–11 μ thick.—*Verrucaria platypyrenia* Nyl. in Flora xlviii. 358 (1865); Leight. Lich. Fl. 450; ed. 3, 481. *V. epidermidis* var. *platypyrenia* Carroll in Journ. Bot. iv. 25 (1866); Croub. Lich. Brit. 119 (1870).

Distinguished by the flattened perithecia and by the peculiar spore characters.

Hab. On bark of ivy and other trees.—*Distr.* Rare in S. and S.W. Ireland.—*B. M.* Ballyedmond, Enniskean and Glenbower, Cork; Old Dromore, Kerry.

34. **A. chlorococca** A. L. Sm.—Thallus green, thickish, subsquamulose-granular. Perithecia minute, black, innate, convex or depressed above, the ostiole a minute pore; perithecial wall black, thin, scarcely visible under the base; asci ellipsoid rather short; paraphyses slender, mucilaginous, disappearing; spores 8 in the ascus, colourless or faintly yellowish, broadly fusiform, obtuse at the apices, 5–7-septate, 30–37 μ long, 4–5 μ thick.—*Verrucaria chlorococca* Leight. Lich. Fl. ed. 3, 484 (1879) emend.

Hab. On mossy bark of tree.—*B. M.* Stokenchurch, Chiltern Hills, Oxfordshire (the only locality).

35. **A. desistens** A. L. Sm.—Thallus scanty. Perithecia minute, black, prominent, the upper part convex; perithecial wall entire; paraphyses none; spores 8 in the ascus, colourless, fusiform, 3–5-septate, 11–16 μ long, 3–4 μ thick; hymenial gelatine wine-red with iodine.—*Verrucaria desistens* Nyl. in Flora l. 180 (1867); Carroll in Journ. Bot. v. 260 (1867); Croub. Lich. Brit. 122; Leight. Lich. Fl. 450; ed. 3, 481. Specimen not seen.

Hab. On old trees.—*Distr.* Rare in S.W. Ireland (Torc Mt., Killarney, Kerry).

119. **LEPTORHAPHIS** Koerb. Syst. Lich. Germ. 371 (1855). (Pl. 53.)

Thallus, crustaceous, thin, usually developed within the bark.

Perithecia simple, globose or semi-globose, black, innate-sessile; ostiole poriform; paraphyses persistent, branched and entangled; asci cylindrical, 4-8-spored; spores acicular-fusiform, straight or bent, 1-pluri-septate, colourless. Spermogones globose or ovoid, with rod-like spermatia.

Similar to *Arthopyrenia*, but with acicular spores.

1. **L. epidermidis** Th. Fr. Lich. Arct. 273 (1860).—Thallus very thin, cream-coloured or greyish, effuse, smooth. Perithecia elliptical-hemispherical, bursting the bark, black and somewhat shining; perithecial wall dimidiate, spreading at the base; paraphyses rather indistinct; spores 8 in the ascus, more or less curved, 1-5-septate, 20-37 μ long, 3-4 μ thick.—*Lichen epidermidis* Ach. Lich. Suec. Prodr. 16 (1798). *Ferrucaria epidermidis* Ach. Meth. 118 (1803); Winch Bot. Guide ii. 44 (1807)? var. *albissima* Ach. Lich. Univ. 276 (1810). *V. oxyspora* Nyl. in Bot. Not. 1852, 179; Cromb. Lich. Brit. 121. *V. albissima* Nyl. Lich. Scand. 282 (1861); Leight. Lich. Fl. 449; ed. 3, 481. *Arthopyrenia oxyspora* Mudd Man. 306 (1861).

Exsicc. Johns. n. 478; Mudd n. 299.

Hab. On bark of birch.—*Distr.* Rare throughout England, Scotland and S. and W. Ireland.—*B. M.* Pease Pottage Gate, Sussex; Thorndon Hall near Brentwood, Essex; Dolgelly, Merioneth; Hoggart's Wood, Ingleby, Cleveland; Crummock Lake Side, Cumberland; Swanston Wood, Edinburgh; Glen Falloch, Perthshire; Morrone, Braemar, Aberdeenshire; Killarney, Kerry.

2. **L. Carrollii** A. L. Sm. in Journ. Bot. xlix. 43 (1911).—Thallus crustaceous, thin, brownish. Perithecia minute, black, scattered, hemispherical, immersed at the base, opening by a small pore; perithecial wall dimidiate; paraphyses slender, branched and entangled; asci elongate-cylindrical, about 90-100 μ long, 10 μ thick; spores 8, parallel in the ascus, slender, acicular, indistinctly multi-septate, 50-80 μ long, 1-2 μ thick, straight or variously bent.

Distinguished by the long slender spores. The perithecia are rather few and scattered.

Distr. On bark of trees.—*B. M.* Glenbower, Cork (the only locality).

120. **MICROTHELIA** Koerb. Syst. Lich. Germ. 372 (1855); emend. Massal. Misc. Lich. 57 (1856). (Pl. 54.)

Thallus crustaceous, superficial or developed within the substratum, not corticated. Perithecia small, superficial or semi-immersed, semi-globose; paraphyses branched, entangled, sometimes mucilaginous and disappearing; asci cylindrical-clavate or pyriform, 2-8-spored; spores ovate or elongate-fusiform, usually 1-septate, rarely 3-5-septate, brown. Spermogones globose minute, with short rod-like spermatia.

1. *M. micula* Flot. ex Koerb. Lich. Syst. Germ. 373 (1855).—Thallus pale-whitish-brown, thin, smooth, effuse. Perithecia minute, black, hemispherical, semi-immersed; perithecial wall dimidiate; spores 8 in the ascus, dark-brown, oblong, 1-septate, slightly constricted, the upper cell rather larger, 15–25 μ long, 5–7 μ thick (usually about 17 μ long, 5 μ thick).—*Verrucaria Lyellii* Leight. Angioc. Lich. 42, t. 18, fig. 3 (1851)? *V. cinerella* Flot. ex Nyl. in Maine et Loire Mém. Soc. Acad. iv. 60 (1858) & Lich. Scand. 281 (non Nyl. in Ann. Sci. Nat. sér. 4, iii. 174 (1855)); Carroll in Journ. Bot. iii. 293 (1865); Cromb. Lich. Brit. 121; Leight. Lich. Fl. 437; ed. 3, 465.

The species *Verrucaria cinerella* Nyl. (Ann. Sci. Nat. l. c.) is a Chilean plant, and has faintly coloured large spores, measuring 32–36 μ long, 11 μ thick; the characters of the British specimens agree with those republished by Nylander in Lich. Scand. l. c.

Hab. On trees.—*Distr.* Rare in S. and W. England, more frequent in S. and W. Ireland, not recorded from Scotland.—*B. M.* Ivybridge, Devon; Sapperton, Gloucestershire; Glengariff, Cork; Tore Mt., Cloghan, Mangerton and Dinish, Killarney, Lough Inchiquin, Glencar and Old Dromore, Kerry.

Var. megaspora B. de Lesdain in Bull. Soc. Bot. France liii. 688 (1906).—Similar to the species but with larger spores, 23–36 μ long, 9–13 μ thick.—*Verrucaria cinerella* var. *megaspora* Nyl. in Flora li. 348 (1868); Cromb. Lich. Brit. 121 & in Journ. Linn. Soc. xi. 490 (1871); Leight. *ll. c.* Specimen not seen.

Hab. On trees.—*Distr.* Rare in S. England, and in Wales, recorded from New Forest, Hants; Trefriw, Carnarvonshire.

2. *M. atomaria* Koerb. Syst. Lich. Germ. 373 (1855).—Thallus thin, greyish. Perithecia minute, hemispherical, semi-immersed, somewhat shining; spores ellipsoid-oblong, 1-septate, dark-brown, small, 12–14 μ long, 4–6 μ thick.—*Lichen atomarius* Ach. Lich. Succ. Prodr. 16 (1798)? *Verrucaria atomaria* DC. Fl. Franc. ii. 313 (1805); Leight. Lich. Fl. ed. 3, 467.

Hab. On bark of hazel, &c.—*Distr.* Rare in W. Ireland, Kylemore, Connemara, Galway.

3. *M. dispersa* A. L. Sm. in Journ. Bot. xlix. 44, t. 510, fig. 8 (1911).—Thallus greyish-white, pulverulent, very thin or disappearing. Perithecia minute, 150–200 μ in diameter, almost globose, shining, black, semi-immersed or almost superficial, or leaving shallow pits in the substratum; perithecial wall black, rather soft, almost entire; paraphyses slender, branched and entangled; asci elongate-clavate, somewhat thickened at the apex, 65 μ long, 15 μ thick, 2-spored; spores oblong, blunt or tapering at one or both ends, 1-septate constricted, brown, 25–35 μ long, 10–12 μ thick.

The specimens in the British Museum were collected by W. Joshua and labelled by him *A. saxicola* var.

Hab. On calcareous rocks.—*B. M.* Sapperton, Gloucestershire.

Form **octospora** Wats. in Journ. Bot. lxiii. (1925).—Similar to the species, but with 8 spores in the ascus.

Hab. On calcareous rocks, Cheltenham (H. H. Knight).

4. **M. exerrans** A. L. Sm.—Thallus thin, blackish, scattered. Perithecia minute, black; perithecial wall entire: spores 8 in the ascus, blackish, oblong, 1-septate, 10–15 μ long, 3–5 μ thick; hymenial gelatine wine-red with iodine.—*Endococcus exerrans* Nyl. in Flora lxii. 360 (1879); Cromb. in Grevillea viii. 114 (1880).

Distinguished by the narrow spores. Nylander notes the rather thick colourless chroolepid gonidia with cells 18–23 μ thick.

Hab. On quartzose stones.—*B. M.* Ben-y-Gloe, Blair Athole, Perthshire.

5. **M. dissepta** A. L. Sm.—Thallus whitish-grey, sometimes faintly yellowish, tartareous, thin, slightly cracked-areolate, subdeterminate (probably not proper). Perithecia black, numerous, somewhat prominent, the upper part convex, the ostiole a minute pore; perithecial wall entire, paraphyses indistinct; spores 8 in the ascus, ellipsoid, brown, 3-septate, 18–22 μ long, 7–10 μ thick; hymenial gelatine not tinged with iodine.—*Verrucaria dissepta* Nyl. in Flora lix. 576 (1876); Cromb. in Grevillea v. 107 (1877); Leight. Lich. Fl. ed. 3, 480.

Nylander (*l. c.*) suggests that possibly the perithecia may be parasitic on the thallus of some other lichen. The specimen from Achill Isl. is on *Rhizocarpon confervoides*.

Hab. On mica-schist rocks.—*Distr.* W. Ireland.—*B. M.* Dooega Road, Achill Isl., Mayo.

121. **PORINA** Ach. Lich. Univ. 60 (1810) pro parte, emend. Muell. Arg. in Flora lxvi. 320 (1883).—*Segestrella* Fr. Lich. Eur. 460 (1831) (*Segestria* tom. cit. 429); Mudd Man. 283. (Pl. 55.)

Thallus variously crustaceous, not corticated, sometimes developed within the substratum. Perithecia simple, superficial or semi-immersed; perithecial wall light-coloured, becoming darker towards the ostiole, entirely dark-coloured, entire or dimidiate; paraphyses persistent, simple; asci elongate, 6–8-spored; spores elongate-fusiform or clavate, colourless, 2- to multi-septate, rarely with longitudinal septa. Spermatogones small, globose with simple or branched sterigmata and rod-like or elongate-fusiform spermatia.

Distinguished from *Arthopyrenia* by the character of the paraphyses and spores. The texture of the perithecial wall is also more variable; it is usually softer in texture, and in some species waxy and light-coloured (*Segestrella*).

Perithecia brightly coloured, waxy; spores 3-7-septate.

1. **P. lectissima** A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 66 (1903).—Thallus pale-olivaceous or reddish-yellow, thin, continuous, subtartareous, effuse. Perithecia small, pale-reddish or becoming darker, semi-immersed, with a rather large ostiole; perithecial wall reddish, dimidiate; paraphyses slender, distinct, longer than the asci; spores 8 in the ascus, fusiform, colourless, 3-septate, 22–32 μ long, 4–7 μ thick; hymenial gelatine not tinged with iodine.—*Segestria lectissima* Fr. Syst. Orb. Veg. i. 287 (1825). *Verrucaria irrigua* Tayl. in Mackay Fl. Hib. ii. 94 (1836); Leight. Angioc. Lich. 56, t. 24, fig. 4. *V. rubiginosa* Tayl. l. c.? *V. erysiboda* Tayl. tom. cit. 98; Leight. l. c. t. 24, fig. 6. *V. lectissima* Nyl. in Bot. Not. 1853, 181 pro parte; Cromb. Lich. Brit. 117 (excl. syn. *Segestria umbonata*); Leight. Lich. Fl. 443; ed. 3, 475; Linds. in Trans. Linn. Soc. xxviii. 299, t. 15, f. 20 (1872). *V. holochrodes* Nyl. in Flora lix. 311 (1876); Cromb. in Grevillea v. 29; Leight. Lich. Fl. ed. 3, 476. *Segestrella lectissima* Mudd Man. 284, t. 5, f. 120 (1861); excl. syn. *Segestria umbonata* and *S. thelostoma*.

Exsicc. Larb. Lich. Cæsar. n. 49, n. 120 (as *Verrucaria holochrodes*); Leight. n. 32 (as *V. irrigua* var. *erysiboda* pro parte).

Easily distinguished by the numerous brightly coloured perithecia; it has been confused with *Lichen thelostomus* Sm. (*Thrombium thelostomum*), but the latter has much larger perithecia and simple spores. *Verrucaria rubiginosa*, *V. erysiboda* and *V. holochrodes* are distinguished by slight differences in thallus or perithecium; the two latter are retained as distinct forms or varieties of the species by some lichenologists.

Hab. On moist or shady rocks.—*Distr.* Rare in the Channel Islands and S.W. England, more frequent in Wales and in S. and W. Ireland, rare in Scotland.—*B. M.* La Coupe and Rozel, Jersey; Dolgelly, Merioneth; Breidden, Montgomeryshire; Cwm Idwal, Cwm Cywion, Bettws-y-Coed and Ffridd-du, near Aber, Carnarvonshire; Cwm Dwfnant, Llanwrtyd, Breconshire; Aberedw, Radnorshire; Garwick, I. of Man; Langdale, Scarsdale and near Staveley, Westmorland; Ballaghbeama Gap, Cloghan, Killarney and Carig, Kerry; Doughruagh Mt., and Killary Bay, Connemara, Galway.

2. **P. humicolor** A. L. Sm.—Thallus thin, brownish. Perithecia scattered or crowded, globose, reddish-brown or blackish, prominent with a slightly beaked ostiole; perithecial wall entire, reddish-yellow in thin sections; paraphyses distinct; spores 8 in the ascus, elongate-fusiform, 3-septate, 24–33 μ long, 4–5 μ thick.—*Verrucaria humicolor* Nyl. in Flora lx. 462 (1877); Cromb. in Grevillea vi. 114; Leight. Lich. Fl. ed. 3, 478.

Exsicc. Larb. Lich. Hb. without number.

Hab. On peaty earth and on rocks among liverworts.—*B. M.* Mwellan, Connemara, Galway (the only locality).

3. *P. leptalea* A. L. Sm.—Thallus thin, greyish, effuse or brownish and subdeterminate. Perithecia minute, hemispherical, almost superficial, reddish, shining, becoming darker especially round the ostiole; perithecial wall dimidiate; paraphyses slender, distinct; spores 8 in the ascus, colourless, 3-septate, 16–23 μ long, 3–5 μ thick.—*Biatora leptalea* Dur. & Mont. Fl. d'Alg. i. 268 (1849). *Verrucaria lectissima* f. *leptalea* Nyl. in Maine & Loire Mém. Soc. Acad. iv. 38 (1858); subsp. *leptalea* Cromb. Lich. Brit. 117; var. *leptalea* Leight. Lich. Fl. 443; ed. 3. 475. *V. leptaleella* Nyl. in Flora lix. 237 (1876); Cromb. in Grevillea v. 29; Leight. Lich. Fl. ed. 3. 480 pro parte.

Exsicc. Larb. Lich. Hb. without number.

V. leptaleella was given specific rank by Nylander on account of its narrower spores; they resemble, when mature, those of *P. leptalea*.

Hab. On trees.—*Distr.* Rare in S. England, Wales, and S. and W. Ireland.—*B. M.* Llanbedr, Merioneth; near Crosshaven and Glenbower, Cork; McCarthy's Island, Dinish and Eagle's Nest, Killarney, Kerry; Delphi, Killary Bay, Connemara, Galway.

4. *P. succina* A. L. Sm.—Thallus dark-brownish, thin, effuse. Perithecia numerous, large, amber-coloured throughout, hemispherical-conical with a papillate ostiole; perithecial wall dimidiate, spreading at the base; paraphyses slender, distinct; asci linear-clavate; spores 8 in the ascus, colourless, fusiform, 7-septate, large, 46 μ long, 5–8 μ thick.—*Verrucaria succina* Leight. in Grevillea iv. 78 (1875) & in Trans. Linn. Soc. (Bot.) ser. 2. i. 145, t. 22, figs. 8–12 (1876); Lich. Fl. ed. 3. 483; Cromb. in Journ. Bot. xiv. 363 (1876).

Considered by Leighton to be closely allied to *P. faginea*, but its affinity is rather with *P. lectissima*, from which it differs chiefly in the larger perithecia and spores.

Hab. On rocks.—*Distr.* Rare in S. and S.W. Ireland.—*B. M.* Blackwater, Wexford.

5. *P. globosa* A. L. Sm.—Thallus greyish-greenish, thin, unequal, continuous. Perithecia rather large, yellowish or yellow flesh-coloured, subglobose; spores 8 in the ascus, broadly fusiform, with a thick epispore, 7-septate, 50–70 μ long, 10–14 μ thick; spores tinged tawny-yellow with iodine.—*Verrucaria globosa* Tayl. ex Nyl. in Flora lxvi. 534 (1883); Cromb. in Grevillea xii. 91 (1884).

The species was overlooked in the previous edition, as it occurs on the same specimen as *Porina succina*, which alone was tested. Nylander has noted that the thallus often covers the fructifications which Crombie (*l. c.*) has described as "pertusarioid"; they are more like a closed *Gyalacta*, in which genus the lichen would rank as a new species; but without more evidence it seems best to leave it, where Nylander placed it, in the Pyrenocarpeæ.

Hab. On rocks.—*Distr.* Rare in S. Ireland.—*B. M.* Blackwater, Wexford (the only locality).

Perithecia dark-coloured ; spores 3-septate.

6. *P. carpinea* A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 66 (1903).—Thallus thin, developed within the bark, grey, olive, or dark-brown, smooth or somewhat wrinkled, effuse or determinate. Perithecia small, black, shining, sessile and subglobose; perithecial wall dimidiate; paraphyses numerous, slender, involvled in mucus but distinct, not branched; asci elongate-cylindrical or -clavate; spores fusiform, 3-septate, colourless, usually 16–20 μ long, 4–6 μ thick, sometimes longer and slightly thicker.—*Verrucaria carpinea* Pers. ex Ach. Meth. 120 (1803); Winch. Fl. North. & Durh. 85 (1831). *V. fusiformis* Leight. Angioc. Lich. 42, t. 18, fig. 2 (1851). *V. chlorotica* f. *carpinea* Cromb. Lich. Brit. 116 (1870); Leight. Lich. Fl. 445; ed. 3, 473. *Arthopyrenia macularis* var. *fusiformis* Mudd Man. 301 (1861).

Exsicc. Bohl. n. 82 (as *Verrucaria olivacea*); Leight. n. 99; Mudd n. 289; Carroll Lich. Hib. n. 34.

Similar to *P. chlorotica* in the form and contents of the perithecia, but differing in habitat and in the structure of the thallus. There has been considerable confusion between this plant and *Verrucaria olivacea* Borr.: the latter has longer multiseptate spores (see p. 370).

Hab. On bark of trees.—*Distr.* Frequent in the Channel Islands, England, and S., W. and Central Ireland, very rare in Scotland.—*B. M.* Torquay, Devon; Crawley, Sussex; Ulting, Essex; near Norton and Shrawly Wood, Worcester; Shelton Rough, near Shrewsbury, and Church Stretton, Shropshire; Gwydir Woods, Bettws-y-Coed and Trefriw, Carnarvonshire; Ayton, Sowerdale and Cliffrigg, Cleveland, Yorkshire; near Harlech, Merioneth; near Wrexham, Denbighshire; Matlock Tor, Derbyshire; near Perth; Castle Bernard, Enniskean, Crosshaven and Tullagreen, Cork; Glencar and Killarney, Kerry; Killaloe, Clare; Mamturk Mts. and Dawros Bridge, Connemara, Galway; Armagh; Louisburgh and Achill Isl., Mayo.

7. *P. affinis* A. Zahlbr. in Oesterr. Bot. Zeitschr. li. 277 (1901).—Thallus whitish-grey or brownish, effuse, smooth or wrinkled. Perithecia black, minute, hemispherical, semi-immersed, becoming prominent; perithecial wall dimidiate; paraphyses distinct, slender, loose; asci small, elongate-cylindrical, slightly swollen in the middle; spores 6–8 in the ascus, colourless, cylindrical-fusiform, 3-septate, 14–21 μ long, 3–4 μ thick.—*Sagedia affinis* Massal. Mem. Lich. 138, t. 25, fig. 169 (1853). *Verrucaria affinis* Cromb. in Journ. Bot. xiv. 362 (1876); Leight. Lich. Fl. ed. 3, 472.

Exsicc. Larb. Lich. Hb. n. 119.

Closely related to the preceding, but with more distinct paraphyses and with smaller asci and spores, the latter being often rather blunt at the ends.

Hab. On bark of trees, holly, birch, &c.—*Distr.* Rare in W. Ireland.—*B. M.* Doughruagh Mt., Loughcooter, Letterfrack and Kylemore, Connemara, Galway.

8. *P. chlorotica* Muell. Arg. in Rev. Mycol. vi. 20 (1884); Wainio Lich. Brésil ii. 224 (1890).—Thallus greyish, olivaceous or brown, thin, effuse or determinate, continuous or slightly cracked or sometimes granular. Perithecia small, black, almost globose and superficial or slightly immersed, minutely papillate at the ostiole; perithecial wall incurved at the base, dimidiate; paraphyses numerous, slender, distinct; asci elongate-cylindrical; spores elongate-fusiform, colourless, 3-septate, usually about $16\text{--}20\ \mu$ long, $4\text{--}6\ \mu$ thick, rarely somewhat larger.—*Verrucaria chlorotica* Ach. Lich. Univ. 283 (1810); Cromb. Lich. Brit. 116 (excl. f. *carpineæ*); Leight. Lich. Fl. 444; ed. 3, 472 (incl. ff. *trachona* & *subintegra* and var. *codonoidea*, excl. f. *carpineæ*). *V. trachona* Ach. Meth. Suppl. 16 (1803); Borr. in Engl. Bot. Suppl. t. 2647? Hook. in Sm. Engl. Fl. v. 154; Tayl. in Mackay Fl. Hib. ii. 93 (1836) pro parte; Leight. Angioc. Lich. 50, t. 22, fig. 1. *V. perminuta* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. 35, t. 2, fig. 6 (1854); Leight. Lich. Fl. 450; ed. 3, 482. *V. Harrimanni* Leight. Lich. Fl. ed. 3, 476 (1879) (non Ach.). *V. codonoidea* Leight. Angioc. Lich. 53, t. 23, fig. 3 (1851); Salw. in Trans. Penz. Nat. Hist. Soc. 1853, 139. *V. subintegra* Nyl. in Flora xlviii. 212 (1865); Carroll in Journ. Bot. iii. 293 (1865); Cromb. Lich. Brit. 116. *Arthopyrenia macularis* Mudd Man. 300, t. 5, fig. 125 (1861) (incl. vars. *codonoidea* & *trachona*, excl. var. *fusiformis*). *Sagedia Harrimanni* Koerb. Syst. Lich. Germ. 362 (1855).

Ersicc. Johns. n. 520; Mudd n. 288 (as *A. macularis*); Leight. n. 138 (as *V. codonoidea*); Larb. Lich. Hb. n. 197 (as *V. Harrimanni*), without number.

The type specimen of Deakin's *V. perminuta* in the British Museum has 4-celled spores, and is also otherwise similar to *P. chlorotica*. Several species or varieties have been founded on slight differences of perithecia and of the thallus, which varies from greyish-green to dark-brown in colour. Watson has observed that the species is usually red on calcareous rocks but loses colour in the herbarium. The specimen of *Verrucaria trachona* from Acharius in the possession of the Linnean Society is a spermogonial form, possibly of *P. chlorotica*. In the Sowerby herbarium there is a specimen of *P. chlorotica* from Miss Hutchins, the original collector of *V. trachona* in Ireland, but the specimen has been labelled by Borrer as *Verrucaria viridula*, and does not altogether correspond with the one figured in Engl. Bot. *V. subintegra*, which is classified as a form by A. Zahlbruckner, has somewhat larger spores (up to $27\ \mu \times 7\ \mu$). It is not to be confused with *V. rupestris* subsp. *integra* quoted on p. 319.

Hab. On rocks.—*Distr.* Not uncommon in the Channel Islands, England, Wales, and Ireland; not recorded from Scotland.—*B. M.* Jerbourg, Guernsey; Boulay Bay, La Coupe, Rozel and Trinity, Jersey; Withiel, Cornwall; Torquay, Devon; Bathford Hill and Weston-super-Mare, Somerset; Barnsley Park, Gloucestershire; Haughmond Hill, Shropshire; Bettws-y-Coed and Trefriw, Carnarvonshire; Buxton, Derbyshire; Bilsdale, near Ayton, Cleveland, Yorkshire; Kentmere and Staveley, Westmorland; Cumberland; near Perth; near Fort

William, Inverness-shire; Blackwater and Derriquin, Killarney, Kerry; Kilemore, near Tully, Doughruagh and Glen Inagh, Connemara, Galway; Cliffs of Moher, Clare; Slievemore Mt. and Mallaranny, Achill Isl., Mayo.

Var. linearis A. L. Sm.—Thallus whitish or sometimes rose-coloured or purplish-red. Spores more obtuse at the ends than in the species.—*Verrucaria linearis* Leight. Angioc. Lich. 52, t. 23, fig. 1 (1851) & Lich. Fl. 441; ed. 3, 475; Cromb. Lich. Brit. 116. *V. chlorotica* f. *persicina* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 36 (1858). *Sagedia persicina* Koerb. Syst. Lich. Germ. 364 (1855). *Arthopyrenia linearis* Mudd Man. 300 (1861) e descript. *Porina chlorotica* var. *persicina* A. L. Sm. Monogr. Part ii. 336 (1911).

Leighton (Angioc. Lich. 52) refers to this variety as the small lichen figured along with *V. Dufourii* in Engl. Bot. Suppl. t. 2791 (see p. 324).

Hab. On calcareous rocks.—**Distr.** Rare in N. and S.W. England and W. Ireland.—*B. M.* Woodale, Buxton, Derbyshire; Knighton, Radnorshire; near Wrexham, Denbighshire; in a cave, Derryclare, near Kilemore, Connemara, Galway.

9. P. tenuifera A. L. Sm. Monogr. Part ii. 336 (1911).—Thallus dark-grey or blackish, thin, continuous or cracked. Perithecia minute, black, hemispherical with a minute ostiole; perithecial wall dimidiate; paraphyses slender, distinct; spores colourless, elongate-acicular, 3-septate, 29–35 μ long, 3–4 μ thick.—*Verrucaria tenuifera* Nyl. in Flora lix. 237 (1876); Cromb. in Grevillea v. 29; Leight. Lich. Fl. ed. 3, 476. *V. pertenuis* Leight. in Trans. Linn. Soc. ser. 2, i. 239, t. 32, fig. 20 (1878) & Lich. Fl. ed. 3, 476.

There is no specimen of *V. tenuifera* in the British Museum, but Larbalestier states that the specimen of *V. pertenuis*, collected at Goodwich Bay, is identical with his original specimen of *V. tenuifera* collected at Jersey.

Hab. On rocks.—**Distr.** Rare in the Channel Islands and S. Wales.—*B. M.* Goodwich Bay, Pembrokeshire (as *V. pertenuis*).

10. P. epigæoides A. L. Sm.—Thallus pale-greenish, thin, resembling a greenish spot. Perithecia black, small, semi-immersed; perithecial wall black over the upper half, brown below; paraphyses slender, distinct; spores 8 in the ascus, elongate, fusiform, 3-septate, 18–27 μ long, 5–8 μ thick.—*Verrucaria epigæoides* Nyl. in Flora l. 329 (1867); Carroll in Journ. Bot. v. 259 (1867); Cromb. Lich. Brit. 116; Leight. Lich. Fl. 446; ed. 3, 477.

Hab. On sandy soil.—**Distr.** Rare in S.W. Ireland.—*B. M.* Moher, Clare.

Perithecia dark-coloured; spores 3-7- (rarely more-) septate.

11. **P. olivacea** A. L. Sm.—Thallus effuse, thin, continuous or becoming slightly cracked, smooth or somewhat wrinkled, dull olive-brown. Perithecia hemispherical, small, numerous, prominent, immersed at the base, black; perithecial wall dimidiate; paraphyses stoutish, free; asci cylindrical-clavate; spores elongate-clavate, 3-7-septate, colourless, 27-40 μ long, 4-5 μ thick.—*Verrucaria olivacea* Pers. in Ust. Ann. Bot. vii. 28, t. 3, fig. 6 (1794)? Borr. in Sm. Engl. Bot. Suppl. t. 2597, fig. 1 (1829); Hook. in Sm. Engl. Fl. v. 150; Tayl. in Mackay Fl. Hib. ii. 89; Leight. Angioc. Lich. 42, t. 18, f. 1 & Lich. Fl. 452; ed. 3, 483; Croub. Lich. Brit. 117. *Arthopyrenia olivacea* Mudd Man. 301 (1861).

Exsicc. Bohl. n. 82; Leight. n. 199; Mudd n. 290.

Hab. On the bark of trees.—*Distr.* Rather rare throughout England and Wales and S. and W. Ireland, not recorded from the Channel Islands nor from Scotland.—*B. M.* Duncton and Hentfield, Sussex; Shere, Surrey; Silbertswold, Kent; near Cirencester and Stowell Park, Gloucestershire; Matlock Tor, Derbyshire; Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Easby Wood and Sowerdale, Cleveland, Yorkshire; Levens, Westmorland; Tullagreen and Ballyedmond, Cork; Muckross, Killarney, Kerry; Killaloe, Clare; Loughcooter, Galway.

12. **P. faginea** Arn. in Flora lxviii. 166 (1885).—Thallus whitish or cream-coloured, thin, effuse. Perithecia black, minute, semi-immersed, hemispherical; perithecial wall dimidiate; paraphyses crowded, distinct; spores broadly lanceolate-fusiform, colourless, usually 5-7- (rarely more-) septate; 30-37 μ long (or longer), 3-8 μ thick.—*Sagedia faginea* (sub *Segestria*) Schær. Enum. 208 (1850). *S. lactea* Koerb. Syst. Lich. Germ. 366 (1855). *Verrucaria lactea* Leight. Lich. Fl. 452; ed. 3, 483.

Hab. On trees.—*Distr.* Rare in S. England (Sussex).

13. **P. leptospora** A. L. Sm.—Thallus very thin, brown. Perithecia minute, black, hemispherical, the base immersed; the ostiole a minute papilla; perithecial wall entire, or thin under the base; paraphyses scanty, distinct; asci cylindrical, slightly narrower upwards, about 90 μ long, 10-12 μ thick; spores 8 in the ascus, colourless, elongate-fusiform, 8- or more-septate, 45-55 μ long, 3-4 μ thick.—*Verrucaria leptospora* Nyl. in Flora xlvii. 487 (1864) & li. 164 (1868); Carroll in Journ. Bot. vi. 101 (1868); Croub. Lich. Brit. 117; Leight. Lich. Fl. 452; ed. 3, 484.

Outwardly very similar to *P. olivacea*, but differing in the entire perithecium and in the character of the spores.

Hab. On bark of holly.—*B. M.* Dinish, Killarney, Kerry.

14. **P. furvescens** A. L. Sm.—Thallus brown or olivaceous-brown, granulate, unequal, thin, effuse not continuous. Perithecia black, moderate in size, innate, the conical ostiole projecting; perithecial wall entire; paraphyses slender, crowded; spores 8 in the ascus, colourless, fusiform, 3–5-septate, 31–33 μ long, 6 μ thick.—*Verrucaria furvescens* Nyl. in Flora xlvii. 356 (1864); Carroll in Journ. Bot. iii. 293 (1865); Cromb. Lich. Brit. 117; Leight. Lich. Fl. 450; ed. 3, 481.

Considered by Nylander to be nearly allied to *P. chlorotica*. The single specimen in the herbarium is too meagre for examination; Carroll (*l. c.*) states that in the specimens examined by him the spores are only 3-septate.

Hab. On the ground on mosses.—*B. M.* Summit of Ben Lawers, Perthshire (the only locality).

15. **P. insiliens** A. L. Sm.—Thallus dirty-brownish-white, thickish, tartareous, deeply cracked, subfurfuraceous. Perithecia large, imbedded in rather large hemispherical thalline tubercles, the ostiole papillate, emerging; perithecial wall blackish-brown, dimidiate, the inner wall pale-brown; paraphyses slender, distinct; spores 8 in the ascus, broadly fusiform, obtuse at the apices, 5–7-septate, 50–67 μ long, 11–14 μ thick; hymenial gelatine colourless with iodine.—*Verrucaria insiliens* Larb. ex Nyl. in Flora lx. 566 (1877); Cromb. in Grevillea vi. 114 (1878); Leight. Lich. Fl. ed. 3, 484. Specimen not seen.

Hab. In deep recesses of caves.—*Distr.* Twelve Pins, Connemara, Galway (the only locality).

16. **P. Curnowii** A. L. Sm. in Journ. Bot. xlix. 44, t. 510, fig. 9 (1911).—Thallus olivaceous-brown, tartareous, thin, unequal, continuous or cracked. Perithecia scattered, black, small, hemispherical, immersed at the base, the ostiole a minute papilla, scarcely visible; perithecial wall dimidiate; paraphyses numerous, slender; asci cylindrical-clavate, 80 μ long, 7–8 μ thick; spores 8 in the ascus, narrowly fusiform, 7- or more-septate, about 52 μ long, 3 μ thick.

Allied to the following, but differing in the character of the spores and in the size and form of the perithecia.

Hab. On conglomerate fragments of rocks.—*B. M.* Penzance, Cornwall (the only locality).

17. **P. lucens** A. L. Sm.—Thallus purplish- or greyish-brown, thin, tartareous, continuous or minutely cracked, sometimes limited by a black line. Perithecia shining black, moderate in size, sessile, sometimes congregate, prominent, hemispherical, the ostiole a depressed pore; perithecial wall dimidiate; paraphyses slender, numerous; spores 8 in the ascus, broadly elongate-fusiform-clavate, up to 7- (rarely more-) septate, sometimes a cell

with a longitudinal division, colourless, large. 38-50 μ long, 8-10 μ thick.—*Verrucaria lucens* Tayl. in Mackay Fl. Hib. ii. 257 (1836); Leight. Angioc. Lich. 55, t. 24, fig. 2 & Lich. Fl. 451; ed. 3, 482; Cromb. Lich. Brit. 117. *Arthopyrenia lucens* Mudd Man. 299 (1861).

Exsicc. Larb. Lich. Hb. n. 280; Johns. n. 440.

The occasional longitudinal division of a spore-cell suggests affinity with *Clathroporina*, but the rather narrow spores resemble those of a *Porina*.

Hab. On rocks and stones.—*Distr.* Rare in the Channel Islands, Wales, and S. and W. Ireland.—*B. M.* Jerbourg, Guernsey; Trefriw Falls and Conway Falls, Carnarvonshire; near Harlech, Merioneth; Staveley, Westmorland; Wastdale Head, Cumberland; Cloghan, Killarney, Kerry; Lough Crotty, Commeragh Mts., Waterford; Doughruagh Mt. and Killary Bay, Connemara, Galway.

18. **P. interseptula** A. L. Sm.—Thallus olivaceous or purplish-brown, thin, effuse. Perithecia black, small, prominent, subglobose, sessile, somewhat shining, the ostiole scarcely visible; perithecial wall dimidiate; paraphyses slender, numerous, free; asci elongate, narrowed at both ends, 8-spored; spores broadly fusiform, 5-septate with occasional somewhat oblique longitudinal septa, colourless, 18-24 μ long, 6-7 μ thick.—*Verrucaria interseptula* Nyl. in Flora lxiv. 453 (1881); Johns. in Trans. Cumb. Ass. Adv. Lit. & Sci. vi. 157 (1881); Cromb. in Grevillea xii. 91.

Strongly resembling the preceding in form of thallus and perithecia, but differing in the size and form of the spores: the longitudinal septa are more constantly present in one or two of the cells than in *P. lucens*.

Hab. On moist siliceous rocks.—*B. M.* Wastdale, Cumberland.

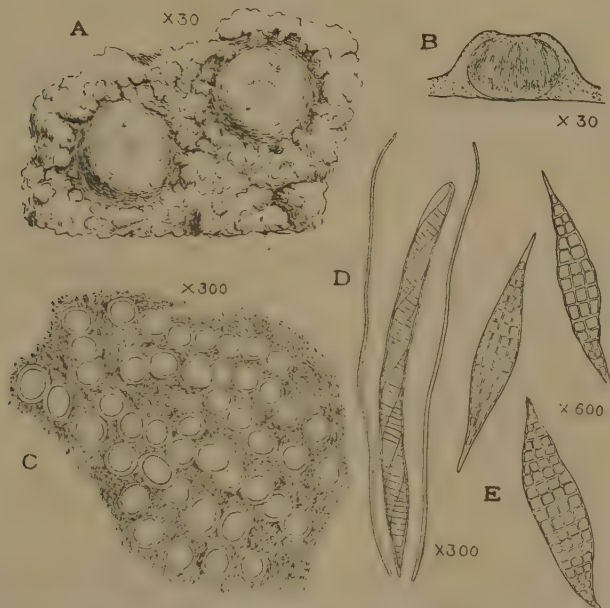
122. **CLATHROPORINA** Muell. Arg. in Flora lxv. 517 (1882).—*Thelenella* Sect. *Clathroporina* Wainio Lich. Brésil ii. 216 (1890).

Thallus crustaceous, superficial or immersed, non-corticated. Algal cells *Trentepohlia*. Perithecia simple, scattered, light- or dark-coloured with a straight punctiform ostiole; paraphyses unbranched, free; spores 8 (or fewer) in the ascus, ellipsoid, elongate, or almost fusiform, muriform, colourless. Spermatogones with cylindrical, straight spermatia.

Mainly a tropical genus and the species usually corticolous, though saxicolous species have been recorded from the West Indies and from Europe. W. Watson's species is the first to be determined in our country, but a re-examination of *Microglana Larbalestierii* has shown that the algal cells in that species are *Trentepohlia* also.

The genus was reported by Dr. Watson after the plates for the present volume had been prepared; text-figures have therefore been substituted.

1. *Cl. calcarea* Wats. in Journ. Bot. lxiii. 131 (1925).—Thallus thin or thickish, whitish, usually with a reddish tinge, or orange-red with minute darker areas, effuse or subdeterminate, pulverulent (I—), with *Trentepohlia* gonidia, 6–10 μ broad. Perithecia minute, almost globose, immersed at the base, pale yellow or becoming greyer and darker when old, with ostioles usually depressed; wall yellow, with rectangular cells; paraphyses



Clathroporina calcarea Wats.—A, Plant on rock with perithecia. B, Vertical section of perithecium. C, Section of thallus with gonidia. D, Ascus and paraphyses. E, Spores.

numerous, long, slender, hyaline, non-septate; spores 6 to 8 in the ascus, massed or almost uniseriate, broadly fusiform pointed at the ends, 54–75 μ long, 10–15 μ thick, 15- or more-septate when mature and muriform; hymenial gelatine slightly greenish-blue, then tawny-reddish with iodine.

An extremely interesting lichen, easily overlooked, as the thallus at first sight seems to be sterile, or some undeveloped scedial stage. The reddish colour tends to disappear in the herbarium. We are indebted to H. H. Knight for both specimens.

Hab. On oolitic walls and on other calcareous rocks.—*B. M.* Wincombe, Somerset; Dovedale, Derbyshire (the only records).

2. **Cl. Larbalestierii** A. L. Sm.—Thallus thin, brownish, mucilaginous when wet, cracked, wrinkled and scattered when dry. Perithecia black above and shining immersed in the thallus, conical, the ostiole protruding, perithecial wall colourless at the base; paraphyses slender, numerous; asci oblong-cylindrical, 8-spored; spores oblong-fusiform, pointed at the ends, colourless, muriform, with many transverse septa (12 or 13) and one or more longitudinal divisions, about $50-55\ \mu$ long, $8-10\ \mu$ thick.—*Microglæna Larbalestierii* A. L. Sm. Monogr. Brit. Lich. ii. 310 (1911).

As noted above, the thallus has been found to contain *Trentepohlia* gonidia. It is evidently very near to *Cl. calcarea*, but different in colour and habitat. The spores were colourless when first examined, but in the microscopic section they have taken up a brownish colour. Collected by Larbalestier and labelled by him *Verrucaria erratica*.

Hab. On rocks in a stream.—*B. M.* Twelve Pins, Connemara, Galway.

123. **THELOPSIS** Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. 194 (1855); emend. A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, 67 (1903). (Pl. 56.)

Thallus crustaceous, not corticated, thin or scarcely visible. Perithecia surrounded by the thallus, becoming prominent and superficial, or immersed in the thallus; perithecial wall soft, light-coloured or dark; paraphyses slender, persistent, unbranched, free; asci many-spored; spores ellipsoid or elongate, usually 1-3-septate, rarely simple, colourless.

Differs from all other genera of the Family in the many-spored asci.

1. **Th. rubella** Nyl. *tom. cit.* 194 & 202.—Thallus indistinct, greyish, or obsolete. Perithecia pale-reddish, spherical, prominent, with a distinct poriform ostiole; perithecial wall colourless in lower portion; asci with 100 or more spores; paraphyses slender, septate; spores ellipsoid, 3-septate, $10-17\ \mu$ long, $5-8\ \mu$ thick; hymenial gelatine wine-red with iodine.—Carroll in Journ. Bot. vi. 101 (1868); Cromb. Lich. Brit. 123. *Verrucaria rubella* Leight. Lich. Fl. 442 (1871); ed. 3, 472.

Hab. On the bark of trees.—*Distr.* Rare in Central Scotland and S.W. Ireland.—*B. M.* Lanrick Castle, near Doune, Perthshire; Dinish, Killarney. Kerry.

2. **Th. melathelia** Nyl. in Flora xlvii. 358 (1864).—Thallus almost obsolete. Perithecia black, prominent, somewhat wrinkled and irregular; perithecial wall blackish or reddish, entire; paraphyses slender, distinct; spores many in the ascus, ellipsoid or oblong, 3-septate, $14-18\ \mu$ long, $4-7\ \mu$ thick; hymenial gelatine blue, then dark-violet, with iodine.—Carroll in Journ.

Bot. iii. 293 (1866); Cromb. Lich. Brit. 123. *Verrucaria melathelia* Leight. Lich. Fl. 447; ed. 3, 478.

Hab. Incrusting mosses on the ground.—*Distr.* Rare in mountainous regions.—*B. M.* Above Loch-na-gat, Ben Lawers and Craig Calliach, Perthshire.

124. **PYRENULA** Ach. Lich. Univ. 64 (1810); emend. Massal. Ric. Lich. 162 (1852); Mudd Man. 298. (Pl. 57.)

Thallus crustaceous, superficial or developed within the substratum, not corticated. Perithecia simple, variously globose, with poriform or slightly beaked ostiole; paraphyses slender, distinct; asci 8-spored; spores elongate, 2-5-septate, the cells variously lentiform or angular in shape, brown. Spermatogones with branched sterigmata and slender bent acrogenous spermatia.

Distinguished from *Microthelia*, which also has brown septate spores, not only by the unbranched paraphyses, but also by the form of the spores. It is largely a tropical or subtropical genus, and only a few species occur in Europe.

P. nitida Ach. Syn. Lich. 125 (1814).—Thallus yellowish-olive or greyish-brown, waxy, continuous, smooth, somewhat shining, sometimes traversed and intersected by blackish lines. Perithecia rather large, black, globose-hemispherical, immersed in or veiled by the thallus, the ostiole more or less protruding, depressed and umbilicate; perithecial wall entire, black; paraphyses distinct; spores ellipsoid-oblong, 3-septate, brown, each cell with an angular oil-drop, 20-27 μ long, 7-10 μ thick; hymenial gelatine not tinged with iodine; spermatogones borne on the limiting hypothallus.—Mudd Man. 298. *Sphaeria nitida* Weigel Obs. Bot. 45, t. 2, fig. 14 (1772); Dicks. Plant. Crypt. Brit. 1, 23; With. Arr. ed. 3, iv. 393; Sow. Engl. Fungi, n. 275. *Verrucaria nitida* Schrad. Journ. Bot. i. 79 (1801); Winch. Bot. Guide ii, 45 (1807); Grev. Fl. Edin. 353; Borr. in Engl. Bot. Suppl. t. 2607, fig. 1; Hook. in Sm. Engl. Fl. v. 149; Tayl. in Mackay Fl. Hib. ii. 87; Leight. Angioc. Lich. 35, t. 15, fig. 3 & Lich. Fl. 447; ed. 3, 478; Cromb. Lich. Brit. 118. *V. glabrata* Carroll in Journ. Bot. iii. 293 (1865) (non Ach.); Cromb. Lich. Brit. 118 pro parte; Leight. Lich. Fl. 448; ed. 3, 479.

Ersicc. Larb. Lich. Cæsar, n. 48; Leight. n. 27; Bohl. n. 106.

The thallus is often punctuated by clear white dots, a growth character not always present. The specimens of "*V. glabrata*" collected by Carroll all belong to this species; they differ only in the absence of the white dots on the thallus.

Hab. On the bark of trees.—*Distr.* Frequent in the Channel Islands, England and Wales, somewhat rare in Scotland and Ireland.—*B. M.* Jersey; Sark; Boconnoc and Withiel, Cornwall; near Plymouth, near Totnes and Torquay, Devon; I. of Wight; Dorset; New Forest, Hants; Arundel Park and Henfield, Sussex; Leigh Woods, Bristol, Somerset; Epping Forest, Gosfield Hall Woods, Ulting, Massing and

Great Braxted, Essex; Church Stretton, Shropshire; Harlech and Dolgelly, Merioneth; Gloddaeth near Conway and Bettws-y-Coed, Carnarvonshire; Thirsk, Kildale, Cleveland and Bilsdale, Yorkshire; Largo, Ayrshire; Achosragan Hill and Barcaldine, Argyll; Glen Falloch, Perthshire; Lochinver, Sutherland; Ballyedmond, Cork; Derryunihiy, Cromaglow, Tore Mts. and Glencar, Killarney; Lough Inchiquin, Kerry; Glenstale, Tipperary; Tully, Connemara, Galway; Belclare and Westport, Mayo; Tinnahinch, Carlow.

Form. *elæodes* A. L. Sm.—Thallus dark blackish or purplish-brown, resembling a diffuse dark oily stain.—*Verrucaria nitida*, f. *elæodes* Leight. Lich. Fl. ed. 3, 479.

Hab. On old laurel and other trees.—*Distr.* Rare in N. Wales.—*B. M.* Bettws-y-Coed, Carnarvonshire.

Var. *nitidella* Schaer. Enum. 212 (1850).—Thallus thin, yellowish or brownish. Perithecia smaller than in the species, entirely immersed or more or less uncovered, the ostiole a small pore not always visible; spores similar to those of the species.—Mudd Man. 299 (1861). Var. *dermatodes* Mudd l. c. *Verrucaria dermatodes* Borr. in Engl. Bot. Suppl. t. 2607, fig. 2 (1829); Hook. in Sm. Engl. Fl. v. 149; Tayl. in Mackay Fl. Hib. ii. 87; Salw. in Trans. Penz. Nat. Hist. Soc., 1853, 141. *V. nitida* var. *dermatodes* Leight. Angioc. Lich. 36, t. 15, fig. 4 (1851). *V. nitida* var. *nitidella* Floerke Deutsche Lich. i. 9 (1815); Nyl. in Maine et Loire Mém. Soc. Acad. iv. 46 (1858); Cromb. Lich. Brit. 118; Leight. Lich. Fl. 448; ed. 3, 479. *V. achroopora* Nyl. in Flora l. 179 (1867). *V. glabrata* Nyl. tom. cit. 330. *V. glabrata* var. *glabrata* Carroll in Journ. Bot. v. 260 (1867); Cromb. Lich. Brit. 118; var. *dermatodes* Leight. Lich. Fl. 449 (1871); ed. 3, 480.

Ersicc. Larb. Lich. Cæsar. n. 99 & Lich. Hb. n. 359; Leight. n. 28; Baxt. Stirp. Crypt n. 73.

The perithecia are somewhat more persistently immersed than in the species; the smaller size in extreme forms represents almost a specific divergence from the type, but in many specimens individual perithecia become larger or are more emergent.

Hab. On smooth bark of trees.—*Distr.* Almost coextensive but rarer than the species; not recorded from Scotland.—*B. M.* Jersey; Sark; Withiel, Cornwall; Becky Falls, Ullacombe, and Berry Castle, Totnes, Devon; Studland, Dorset; Chalford, Gloucestershire; Wakehurst and Hastings, Sussex; Bagley Woods, Berks; Gloddaeth, Conway, Carnarvonshire; Bolton Woods, Lancashire; Kildale and Ayton, Cleveland, Yorkshire; Derryunihiy and Tore Mts., Cromaglow, Cloghan and Muckross Demesne, Killarney, Kerry; Dunfanaghy, Donegal; Saintfield, Down.

125. **ANTHRACOTHECIUM** Hampe ex Massal. in Att. Ist. Venet. ser. 3, v. 330 (1860); A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 68 (1903). (Pl. 58.)

Thallus crustaceous, superficial or developed within the substratum. Perithecia simple, scattered or coherent, more or

less immersed, globose or somewhat angular with entire perithecial wall; paraphyses unbranched, free; spores 1-8 in the ascus, elongate or ellipsoid, brown, muriform, the cells containing lentiform, round or angular guttæ. Spermatogones globose, small; spermatia threadlike, bent.

A corticolous, tropical and subtropical genus, with only one representative in Europe.

A. hibernicum A. L. Sm.—Thallus yellowish-olive or brownish, waxy, continuous, smooth and somewhat shining. Perithecia globose, large, black, deeply immersed in the tissue of the substratum, solitary or usually several cohering, opening by a pore, raising and splitting the thallus and cuticle; perithecial wall very thick, entire, with an inner very dark layer; paraphyses numerous, slender; asci 8-spored, the spores varying in form and size, usually ellipsoid and blunt at the ends, sometimes slightly bent, colourless, usually becoming brown, with 1-5 distinct septa and others less clearly marked, muriform, the walls between the cells swollen and indistinct, the separate cells visible only as separate globose or angular guttæ, 50-110 μ long, 20-40 μ thick.—*Verrucaria hibernica* Nyl. in Flora li. 163 (1868); Leight. in Ann. & Mag. Nat. Hist. ser. 4, i, 483 (1868). *V. pyrenuloides* var. *hibernica* Carroll in Journ. Bot. vi. 101 (1868); Cromb. Lich. Brit. 118; Leight. Lich. Fl. 458; ed. 3, 490.

Considered by Nylander to be closely allied to, if not a variety of, *Verrucaria pyrenuloides* (*Trypethelium pyrenuloides* Mont. in Ann. Sci. Nat. sér. 2, xix. 69 (1843)), a plant of tropical and subtropical regions. It differs in the lighter-coloured thallus and somewhat in the form of the spores. I have not seen a specimen of Montagne's plant.

Hab. On hazel.—*B. M.* Torc Mt. and Eagle's Nest, Killarney, Kerry (the only localities). Collected by Carroll, Sept. 1867.

Family XXXII. THELOCARPACEÆ.

Horizontal thallus wanting. Algal cells Protococcaceæ. Perithecia superficial, surrounded by a gonidial sheath, completely enclosed or opening by a pore; asci with numerous simple or septate spores.

A somewhat peculiar and aberrant Family. The single genus *Thelocarpon* was included by Nylander in the *Pyrenocarpei* (Mém. Soc. Sci. Nat. Cherb. v. 135 (1857)). Later it was transferred to the fungi by Rehm (*Hedwigia* xxx. 3 (1891)), who regarded it as one of the Hypocreaceæ. A. Zahlbruckner, who rejects that classification on account of the well-defined gonidial structure, has included it in the Acarosporaceæ, along with other genera distinguished by many-spored asci (see p. 115).

126. **THELOCARPON** Nyl. in Mém. Soc. Sci. Nat. Cherb. ii. 338 (1854), emend. in Flora lvi. 299 (1873). (Pl. 59.)

Thallus forming small scattered or congregate verrucæ, each

one enclosing a perithecium. Perithecia almost globose, completely enclosed or opening above by a pore: perithecial wall colourless, slightly developed; paraphyses slender, simple or branched or wanting; asci elongate, clavate or ventricose-fusi-form, many-spored; spores minute, colourless, simple or pseudo-septate. Spermogones unknown.

Species of *Thelocarpon* are evidently of rare occurrence, but owing to their minute size they are probably overlooked. There have been no records in recent years.

1. **Th. Laureri** Nyl. in *Mém. Soc. Sci. Nat. Cherb.* iii. 191 (1855) & in *Flora* xlviii. 261 (1865).—Thallus confined to minute scattered or aggregate verrucæ, yellowish-green. Perithecia minute, enclosed in the verrucæ, soft, globose, citrine- or greenish-yellow, the ostiole slightly depressed and inconspicuous; perithecial wall colourless; paraphyses scanty, slender, branched, shorter than the asci; asci flask-shaped, broad in the middle, narrower upwards, about 100 μ long, 12 μ thick; spores minute, colourless, oblong, obsoletely guttulate at each end, 2.5–4 μ long, 1.5–2 μ thick; hymenial gelatine scarcely tinged, the asci pale-bluish, with iodine.—Leight. in *Ann. Mag. Nat. Hist.* ser. 3. xiv. 401, t. 9, ff. 1–5 (1864) & *Lich. Fl.* 407; ed. 3. 439; *Cromb. Lich. Brit.* 106. *Sphaeropsis Laureri* Flot. in *Bot. Zeit.* v. 65 (1847).

Exsicc. Leight. n. 351; *Larb. Lich. Hb.* n. 357.

Hab. On old rails and on burnt ground.—*Distr.* Rare and scarce in Central England.—*B. M.* Middletown and Arkoll Hill, Shropshire.

2. **Th. intermediellum** Nyl. in *Flora* xlviii. 261 (1865).—Thallus forming small verrucæ, yellowish-green. Perithecia minute, globose, enclosed in the verrucæ, depressed at the ostiole; paraphyses absent; asci broad towards the middle, tapering upwards; spores minute, oblong, guttulate at each end, 3.5–5 μ long, 2 μ thick; hymenial gelatine tawny-wine-red, the asci faintly bluish, with iodine.—Phillips in *Grevillea* ii. 125, t. 21 (1874); *Leight. Lich. Fl.* ed. 3. 439.

Distinguished from the preceding species by the somewhat large size of the perithecia and the absence of paraphyses. I have given the size of the spores as recorded by Phillips, but in the specimens examined they are constantly small, measuring about 2–3 μ long, 1.5–2 μ thick. Nylander calls attention to the paraphyses, fasciculate filaments which occur near the ostiole and replace the paraphyses.

Hab. On rotten wood and old leather.—*B. M.* Near Shrewsbury, Shropshire.

3. **Th. superellum** Nyl. in *Flora* xlviii. 261 (1865).—Thallus in scattered verrucæ, greenish-yellow. Perithecia small, globose, the ostiole subconical; paraphyses very abundant, straight, slender and thread-like; asci tapering upwards; spores ellipsoid, 9–12 μ long, 4–4.5 μ thick; hymenial gelatine not tinged, the

asci bright-blue, with iodine.—Leight. in *Grevillea* iii. 116 & *Lich. Fl.* ed. 3, 440; *Cromb. in Journ. Bot.* xiii. 142 (1875).

Externally not unlike the two preceding species though the perithecia are slightly larger and not depressed above. The paraphyses are markedly dissimilar, and the spores larger.

Hab. On earth and decaying hepatics, rare.—*B. M.* Trefriw, Carnarvon.

4. **Th. epithallinum** Leight. in *Ann. Mag. Nat. Hist.* ser. 3, xviii. 24 (1866); *Nyl. in Flora* xlix. 420 (1866).—Thallus in scattered verrucæ, yellowish-green. Perithecia minute, globose; paraphyses stouter than in the preceding species, rather short and unbranched; asci elongate, linear-cylindrical; spores oblong or cylindrical-oblong, 6–7 μ long, 2–2.5 μ thick: hymenial gelatine not tinged, the asci tawny-reddish, with iodine.—*Cromb. Lich. Brit.* 107; *Leight. Lich. Fl.* 407; ed. 3, 439. Specimen not seen.

Allied to the Lapland species, *Th. epibolum* *Nyl. l. c.*, but differing in the slightly larger spores and stouter paraphyses. Leighton referred to it in *Ann. Mag. Nat. Hist.* ser. 3, xiv. 402 (1864), but did not then discriminate between it and *Th. Laureri*.

Hab. Parasitic on the thallus of *Bæomyces rufus* in an upland hilly district (Stiperstones Hill, Shropshire).

Family XXXIII. TRYPETHELIACEÆ.

Thallus crustaceous, not corticated, superficial or developed under the bark (*hypophlæodal*), sometimes almost obsolete. Algal cells (*gonidia*) *Trentepohlia*. Perithecia united in a stroma, each with a separate ostiole; spores 2–8 in the ascus, septate, colourless or brown.

The Family is well represented in tropical and subtropical regions; there is only one British genus.

127. **MELANOTHECA** Fée *Ess. Crypt. Suppl.* 70 (1837); emend. *Nyl. in Maine et Loire Mém. Soc. Acad.* iv. 69 (1858). (*Pl.* 60.)

Thallus forming spots on the substratum or scarcely visible. Perithecia several confluent in a stroma, the inner dividing walls more or less distinct, the upper common wall black; paraphyses present, confused or distinct; asci usually 8-spored; spores elongate, 1–many-septate, colourless or coloured.

Mueller Argau (in *Engl. Bot. Jahrb.* vi. 376 (1885)) has limited the genus to include only species with coloured spores. As here understood it includes species with spores either colourless or coloured. Species with coloured spores have been classified under *Tomasellia*. *Melanotheca* and *Tomasellia* are mainly tropical genera.

1. **M. gelatinosa** *Nyl. in Mém. Soc. Sci. Nat. Cherb.* v. 140, 145 (1857), emend.—Thallus forming pale or brown spots on the

bark, usually determinate with a dark line at the circumference. Perithecia many in a small roundish flat black stroma, dotted with the ostioles; perithecial walls brownish or almost colourless, not distinct at the base; paraphyses indistinct, somewhat crushed; asci obpyriform; spores oblong-ellipsoid, blunt at the ends, colourless becoming brownish, $23\ 27\ \mu$ long, $7\text{--}10\ \mu$ thick; hymenial gelatine not tinged, the asci yellowish-red, with iodine.—Jones in Proc. Nat. Hist. Soc. Dublin 1864, 129; Croub. Lich. Brit. 123; Leight. Lich. Fl. 466; ed. 3, 498. *Arthonia gelatinosa* Chev. in Journ. Phys. Chim. Hist. Nat. Paris xciv. 54 (1822). *A. punctiformis* var. *olivacea* Leight. in Ann. & Mag. Nat. Hist. ser. 2, xiii. 438 (1854); Mudd Man. 247.

Exsicc. Mudd n. 232 & Leight. nos. 223 (as *Arthonia punctiformis* var. *olivacea* Ach.), 358 (as *A. punctiformis* var. *galactina*); Larb. Lich. Hb. n. 40; Johns. n. 480.

Classified by A. Zahlbruckner (Catal. Lich. Univ. i. 474 (1922)) under *Tomasellia* on account of the brownish spores. Similar in outward appearance to *Tomasellia arthonioides* Massal. (Flora xxxix. 284 (1856)), a continental plant, but differing in the lighter coloured walls of the perithecia, the less distinct paraphyses and larger spores. The latter are at first colourless and 1-septate, becoming brownish and 3-septate.

Hab. On the smooth bark of trees.—*Distr.* Frequent throughout Great Britain and Ireland, rare in the Channel Islands.—*B. M.* Withiel, Cornwall; near Becky Falls, Torquay and Cornwood, Devon; near Handcross, near Balcombe, Newtimber, Tilgate and Tunbridge Wells, Sussex; Hailey Wood and Chedworth Wood, Gloucestershire; Stableford and Church Stretton, Shropshire; Dolgelly, Merioneth; Dolbadarn Castle, Llanberis and Conway Falls, Carnarvonshire; Baysdale and near Ayton, Cleveland, Yorkshire; Asby, Cumberland; Arrochar, Dumbarton; Appin, Argyll; Glen Lochay, Killin and Blair Athole, Perthshire; Glen Cluny, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Ballyedmond and Riverstown, Cork; by Glenmore Lake, Kerry; Glenstale, Tipperary; Kylemore, Connemara, Galway; Clare Island, Mayo; Deer Park, Glenarm, Antrim; Kireubbin, Down.

2. *M. diffusa* Leight. Lich. Fl. 467 (1871).—Thallus forming effuse greyish spots. Perithecia several in irregularly round or oblong stromata; perithecial walls colourless; paraphyses stoutish rather crushed; spores linear-oblong, smoky-brown, 1-septate, slightly constricted, $22\ 27\ \mu$ long, $5\text{--}6\ \mu$ thick.—Croub. in Journ. Bot. ix. 179 (1871); Leight. op. cit. ed. 3, 498.

Hab. On the bark of young trees.—*Distr.* Rare in N. Wales.—*B. M.* Nant Gwynant, Snowdon, Carnarvonshire.

3. *M. ischnobela* Nyl. in Flora lix. 238 (1876).—Thallus whitish, forming rather large effuse spots. Stromata small, scattered, somewhat convex; perithecia 2–4 in each stroma, perithecial walls dimidiate, black; paraphyses slender, numerous; asci cylindrical; spores 8 in the ascus, acicular, multi-guttulate

and 1-multi-pseudo-septate, 60–115 μ long, 1–2 μ thick.—Cromb. in Journ. Bot. xiv. 363 (1876); Leight. Lich. Fl. ed. 3, 499. *Verrucaria myriospora* Leight. in Trans. Linn. Soc. ser. 2, i. 145, t. 22, figs. 1–3 (1876).

Exsicc. Larb. Lich. Hb. n. 60.

Distinguished by the smaller stromata and by the acicular, colourless spores.

Hab. On holly.—*B. M.* Kylemore, Connemara, Galway (the only locality).

Family XXXIV. MYCOPORACEÆ.

Thallus crustaceous not corticated, superficial or developed within the bark (*hypophlæodal*). Algal cells *Palmella* or *Trentepohlia*. Perithecia compound, several united in a common outer dark-coloured wall (*peridium*), but with separate ostioles; spores 6–8 in the ascus, variously septate, colourless or coloured.

A small Family represented in Great Britain by two genera:—

Algal cells <i>Palmella</i>	128. Mycoporum.
Algal cells <i>Trentepohlia</i>	129. Mycoporellum.

128. **MYCOPORUM** Flot. ex Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. 186 (1855). (Pl. 61.)

Thallus thin or obsolete. Algal cells *Palmella*. Perithecia compound with a dark-coloured outer wall (*peridium*), the different hymenia not distinctly separated; asci elongate or pyriform-ellipsoid; paraphyses entangled or disappearing; spores 6–8 in the ascus, colourless or becoming dark-coloured, variously septate or muriform.

The generic name *Dermatina* Almq. in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, 8, note (1880) has been substituted by Zahlbruckner (Catal. Lich. Univ. i. 547 (1922)). The established name *Mycoporum* has been retained here, on account of long usage and also of its association with *Mycoporellum*.

1. **M. Quercus** Muell. Arg. in Flora lxv. 402 (1882).—Thallus very thin, indicated by a pale spot, or obsolete. Perithecia 2–6-compound; the outer peridium small, black, nodulose with the ostioles of the enclosed perithecia; perithecial walls dark below, indistinct laterally; paraphyses crushed, almost disappearing; asci broadly ellipsoid; spores 8 in the ascus, oblong, 3–5-septate with 1 or 2 longitudinal divisions, colourless, becoming brownish, 15–18 μ long, 5–8 μ thick.—*M. miserrimum* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. 145 (1857); Carroll in Journ. Bot. iii. 292 (1865); Cromb. Lich. Brit. 106; Leight. Lich. Fl. 406, 485; ed. 3, 438. A. L. Sm. Monogr. Lich. Part. ii. 349. *Arthonia Quercus* Massal. Ric. Lich. 169, fig. 337 (1852). *Dermatina Quercus* Zahlbr. *tom cit.* 551.

Exsicc. Mudd n. 231 (as *Arthonia punctiformis*).

Hab. On smooth bark of trees.—*Distr.* Not uncommon in England and Wales.—*B. M.* Withiel, Cornwall; Ullacombe, Devon; Somerton and Minehead, Somerset; Polegate, Sussex; Chedworth Wood and Hailey Wood near Cirencester, Gloucestershire; Pontesford, Shropshire; Nannau, Dolgelly, Merioneth; Hoggart's Wood, Ingleby and near Guisboro, Cleveland, Yorkshire.

2. *M. ptelæodes* Nyl. Lich. Scand. App. 291 (1861).—Thallus forming pallid spots or obsolete. Perithecia united in small scattered peridia, the upper wall black, the basal wall scarcely developed; paraphyses scanty, disappearing; spores 8 in the ascus, ovoid-ellipsoid, 3-septate, usually with one longitudinal septum, colourless, 12–16 μ long, 6–8 μ thick.—Cromb. in Journ. Bot. xiv. 363 (1876); Leight. Lich. Fl. ed. 3. 438. *Verrucaria punctiformis* var. *ptelæodes* Ach. Meth. 119 (1803). *Dermatina ptelæodes* Zahlbr. tom. cit. 549.

Closely allied to the preceding, but with a less developed basal wall and shorter spores.

Hab. On trees (alder).—*Distr.* Rare in W. England.—*B. M.* Cleve Hill, Cheltenham, Gloucestershire.

129. **MYCOPORELLUM** A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, 78 (1903). (Pl. 62.)

Thallus crustaceous, thin or obsolete. Algal cells *Trentepohlia*. Perithecia compound with a dark-coloured outer wall (*peridium*), the different perithecia not distinctly separated; asci ellipsoid; paraphyses scanty or wanting; spores 8 in the ascus, elongate, separate, colourless or brownish.

1. *M. obscurum* A. L. Sm.—Thallus thin, forming spots on the bark. Perithecia compound, thickly scattered over the bark, orbicular or angular; the outer peridial wall developed over the top, black, the lower wall colourless; perithecial walls indistinct; paraphyses scanty, indistinct; spores 8 in the ascus, oblong-clavate, 3-septate, halonate, the upper cell slightly larger, 15 μ long, 5 μ thick.—*Opegrapha obscura* Pers. in Ust. Ann. Bot. vii. 32, t. 3, fig. 5. B (1794); *O. atra* var. *obscura* Schaer. Spicil. Lich. Helv. 326 (1836) & Enum. 155 (1850); Leight. in Ann. Mag. Nat. Hist. ser. 2. xiii. 441, t. 8, fig. 37 (1854). *Mycoporum obscurum* Almq. in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, 8 (1880).

Hab. On bark of trees.—*B. M.* Will's Braes, Forfar.

2. *M. sparsellum* Muell. Arg. in Rev. Mycol. vi. 14 (1884).—Thallus white, thin, determinate. Perithecia compound, enclosed in a black prominent rugose roundish or irregular peridium, colourless below; paraphyses indistinct; spores 8 in the ascus, ovoid, colourless or faintly smoky-brown, 1-septate, rounded at the ends, slightly constricted, 18–22 μ long, 7–10 μ thick.—*Mycoporum sparsellum* Nyl. in Flora xlvii. 618 (1864) & in Ann. Sci.

Nat. sér. 5, vii. 343 (1867); Carroll in Journ. Bot. vi. 101 (1868); Cromb. Lich. Brit. 106; Leight. Lich. Fl. 405; ed. 3, 437.

Recorded with several other tropical and sub-tropical species only from S.W. Ireland. The thallus of Lindig's specimen (No. 62) described by Nylander *l. c.* from New Granada contains *Trentepohlia* algæ, which, along with the septate spores, indicates its position in *Mycoporellum*.

Hab. On holly.—*Distr.* Rare in S.W. Ireland (Cromaglow, Killarney).

There are a number of specimens in the British Museum classified under the genera *Lepraria* Ach. (Lich. Suec. Prod. 5 (1798)), *Spiloma* Ach. (Meth. 9 (1803)), and *Byssus* Mich. (Nov. Plant. Gen. 210 (1729)), which have been specifically determined by their collectors. These genera and species, generally accepted by older lichenologists, are the early or imperfect conditions of crustaceous lichens, or sometimes of algæ or fungi, most of them indeterminable. They grow usually in moist or shady situations that favour irregular growth, while retarding the normal development of thallus and fruit.

IMPERFECT LICHEN

Botrydina vulgaris Bréb. ex Meneghini in Mem. R. Accad. Sci. Torino, ser. 2, v. 98 (1842); emend. Acton in Ann. Bot. xxiii. 579 (1909).—Thallus forming small green spherical mucilaginous bodies 20–300 μ in diameter, rarely larger, with a central mass of green algal cells (*Coccomyxa subellipsoidea* Acton, *tom. cit.* 573) and a pseudo-parenchymatous envelope of fungal cells which proliferate inwardly among the algæ. Fruit not developed.

Considered by E. Acton to be a primitive lichen distinguished from mere *soredia* by the structure of the fungal envelope. The fungus, when grown in a separate culture, developed coiled branches which suggested affinities with the *Helicosporæ*.

Hab. Among bryophytes on rocks or on the ground, in damp shady situations, chiefly in mountainous districts. Common in various districts.

EXCLUDED GENERA

Lophothelium Stirton in Scott. Nat. ix. 37 (1887); A. L. Sm. Monogr. Lich. ii. 265 (1911).

L. acervatum Stirton l. c. On examination of Stirton's type specimens it was found that while there were present masses of *Glaucapsa* and other blue-green algae, described as "crustaceous, dark-brown" by Stirton; the true thallus bearing the fertile tubercles was composed of thickly scattered squamules of *Stereocaulon condensatum*. Some of these squamules have been attacked and deformed by a Pyrenomycetous fungus, evidently *Discothecium* sp. (see p. 387). A plant of *Stereocaulon condensatum* similarly deformed is in the Crombie Herbarium in the British Museum from Killin, Perthshire.

Pyrenococcus Wheld. & Wils. in Journ. Bot. liii. Suppl. 69 (1915); A. L. Sm. Monogr. Lich. i. 482 (1918).

Based by Wheldon and Wilson as a lichen genus on *Endococcus exoriens* Stirton (Scott. Nat. v. 220 (1880)). The specimen is evidently a fungus parasitic (*vide* Stirton) on the thallus of *Pannaria* sp. It was collected at Craig Var, near Kinloch Rannoch, Perthshire.

SPECIES OF MICROFUNGI RECORDED BY BRITISH AUTHORS AS LICHENS.

A number of species now recognized as parasitic fungi have been recorded as lichens by British authors. Certain species transferred by some students to fungi on account of their apparent parasitism have, however, proved on re-examination to be true lichens (see note *Bacidia flavovirescens*, p. 179), others have been found to be midway between lichens and fungi and rank as *parasymbionts* (see note on *Buellia Parmeliarum*, p. 200). Fungi parasitic on lichens are numerous and have been studied by Lindsay (Trans. Roy. Soc. Edinb. xxv. 513-515, 2 pls. (1869), and in Quart. Journ. Microsc. Sci. n. ser. ix. 49-57 *et passim* (1869)); by Zopf in Hedwigia xxxv. 312-366 (1896) and in Nova Acta Acad. Cæs. Leop.-Carol. lxx. n. 2, 97-190 (1897), & n. 4, 243-288 (1898); more exhaustively by Vouaux (Bull. Soc. Mycol. France xxviii. 177-208 *et passim*, 1912-1914), and recently by Keissler (Beih. Bot. Centralbl. xxxvii. 2, 263-278 (1920), continued in Ann. Naturhist. Museum Wien xxxiv. (1921)). Keissler has also published observations on Lichen Parasites in the Upsala herbarium (Ark. Bot. K. Svensk. Vetensk. xviii. n. 16, 1-24 (1923)).

In the following list only those species are enumerated that have been described in Britain as lichens or have been recorded in some Lichen Flora. Vouaux's "Synopsis" has been mainly followed in the order of determination and classification.

PYRENOMYCETES.

Family SPHÆRELLACEÆ.

Sorothelia squamarioides Zopf l. c. 113. *Sphæria squamarioides* Mudd Man. 130 (1861) (as fungus). *Ticothecium squamarioides* Wint. in Hedwigia xxv. 17 (1886); A. L. Sm. Monogr. Lich. ii. 343 (1911).

Family MYCOSPHERELLACEÆ.

Laestadia (?) *psoromoides* Vouaux in Bull. Soc. Mycol. Fr. xxviii. 220 (1912).—*Physalospora* (?) *psoromoides* Wint. in Hedwigia xxv. 23 (1886); A. L. Sm. Monogr. Lich. ii. 344. *Verrucaria psoromoides* Borr. in Engl. Bot. Suppl. t. 2612, f. 1

(1829). *Endocarpon psoromoides* Hook. in Sm. Engl. Fl. v. 157 (1833); Leight. Angioc. Lich. 13; Mudd Man. 267.

Pharcidia ? dubiella A. L. Sm. Monogr. Lich. ii. 344 (1911).—*Verrucaria dubiella* Nyl. in Flora xlviii. 356 (1865); Carroll in Journ. Bot. iv. 25 (1866); Cromb. Lich. Brit. 115; Leight. Lich. Fl. 446; ed. 3, 477.

Ph. epicymatia Wint.; in Rabenh. Krypt. Fl. I. 2, 342 (1885); Vouaux tom. cit. 227.—*Ph. congesta* Koerb. Parerg. Lich. 470 (1865); Linds. in Quart. Journ. Micros. Sci. n. ser. ix. 343 (1869). Listed as a microlichen by Lindsay.

Ph. innatula Vouaux tom. cit. 244.—*Verrucaria innata* Nyl. in Flora xlviii. 358 (1865); Linds. tom. cit. 353; Leight. Lich. Fl. 462; ed. 3, 494. *V. innatula* Hue Add. 301 (1886-1888).

Ph. Crombii Sacc. & D. Sacc. Syll. xvii. 468 (1905).—*Endocarpon Crombii* Mudd Brit. Clad. 36 (1865). Cromb. in Journ. Bot. vii. 233 (1869); Linds. tom. cit. 351.

Ph. aggregata Vouaux op. cit. xxviii. 252 (1912).—*Thelidium aggregatum* Mudd Man. 298 (1861); Jones in Proc. Nat. Hist. Soc. Dublin iv. 137 (1865); Linds. tom. cit. 346.

Ph. superposita Sacc. & D. Sacc. tom. cit. 649; Vouaux tom. cit. 248.—*Verrucaria superposita* Nyl.; Lind. tom. cit. 350. Recorded as *Thelidium superpositum* (see p. 328).

Ph. microspila Wint. in Rabenh. Krypt. Fl. I. 2, 346 (1885); Vouaux tom. cit. 247.—Recorded as *Arthopyrenia microspila* (see p. 353).

Ph. allogena Sacc. & D. Sacc. tom. cit. 648; Vouaux tom. cit. 244.—*Verrucaria allogena* Nyl.; Linds. tom. cit. 350. Recorded as *Arthopyrenia allogena* (see p. 356).

? **Ph. consociata** A. L. Sm.—*Verrucaria consociata* Nyl. ex Carroll in Journ. Bot. iii. 293 (1885). A very minute, unsatisfactory plant, "apparently parasitic on an alien thallus. The spores are 1-septate and broader at one end."

Sphærulina endococcoidea Sacc. & D. Sacc. tom. cit. 695; Vouaux op. cit. xxix. 35 (1913).—*Verrucaria endococcoidea* Nyl. in Flora xlviii. 356 (1865); Carroll in Journ. Bot. iv. 25 (1866); Linds. in Quart. Journ. Microsc. Sci. n. ser. ix. 351 (1869); Cromb. Lich. Brit. 116; Leight. Lich. Fl. 461; ed. 3, 493.

Under this genus Vouaux (tom. cit. 36, 37) has placed the species of *Obrizum*, *O. corniculatum* and *O. dolichoteron* (see p. 289).

Muellerella polyspora Hepp ex Mueller in Mém. Soc. Phys. Hist. Nat. Genève xvi. 420; A. L. Sm. Monogr. Lich. ii. 345 (excl. syn. *Endococcus haplotellus*, &c.).

This species has been considered distinct from the following on account of the perithecia being lighter coloured at maturity.

M. haplotella Arn. in Flora lvii. 155 (1874).—*Endococcus haplotellus* Nyl. in Flora l. 180 (1867); Carroll in Journ. Bot. vi.

101 (1868); Cromb. Lich. Brit. 122. *Verrucaria haplotella* Leight. Lich. Fl. 463 (1871); ed. 3, 495.

Discothecium gemmiferum Vouaux *op. cit.* xxix. 46 (1913).—*Verrucaria gemmifera* Tayl. in Mackay, Fl. Hib. ii. 95 (1836); Leight. Angioc. Lich. 47, t. 20, f. 3 & Lich. Fl. 464; ed. 3, 495. *V. melaspora* Tayl. in Journ. Bot. vi. 153 (1847)?; *V. rugulosa* Borr. ex Leight. Angioc. Lich. 47, t. 21, f. 1 & Lich. Fl. 440; ed. 3, 470. *V. Larbalestierii* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 242, t. 33, figs. 15–17 (1878) & Lich. Fl. ed. 3, 471 (spore-measurements too large). *Endococcus gemmiferus* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 64 (1858); Cromb. Lich. Brit. 122. *E. rugulosus* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. 439 (1856); Cromb. l. c. *Microthelia rugulosa* Mudd Man. 306 (1861); Linds. in Quart Journ. Microsc. Sci. n. ser. ix. 348 (1869). *M. gemmifera* Mudd Man. 307. *Ticothecium gemmiferum* Koerb. Parerg. 468 (1865); Linds. *tom. cit.* 347; Massee in Grevillea xvii. 4; A. L. Sm. Monogr. Lich. ii. 343.

The genus *Discothecium*, with 8-spored ascus, has been kept distinct by Vouaux from *Ticothecium*, which has a many-spored ascus.

D. calcaricolum Vouaux *tom. cit.* 49.—*Microthelia calcaricola* Mudd Man. 306, t. 5, f. 128 (1861); Linds. l. c. *Endococcus perpusillus* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 64 (1858); Linds. *tom. cit.* 350; Cromb. Lich. Brit. 123. *E. calcareus* Nyl. ex Cromb. *tom. cit.* 122 (1876). *Verrucaria calcaricola* Leight. Lich. Fl. 464 (1871); ed. 3, 495. *V. perpusilla* Leight. l. c. 496. *Ticothecium calcaricolum* Arn. in Verh. Zool.-Bot. Ges. xxiii. 521 (1873); Massee in Grevillea xvii. 4; A. L. Sm. Monogr. Lich. ii. 343. *T. perpusillum* Arn. in Flora Ivii. 27 (1874); Massee l. c.; A. L. Sm. l. c.

Var. **fumosaria** Vouaux *tom. cit.* 54.—*Verrucaria fumosaria* Leight. in Trans. Linn. Soc. (Bot.) ser. 2, i. 239, t. 32, f. 10 (1878) & Lich. Fl. ed. 3, 493.

Discothecium acervatum A. L. Sm.—Perithecia black minute, crowded on and distorting the squamules of *Stereocaulon*; perithecial wall thin, brownish-black; paraphyses crowded, septate; spores uniseriate (?) or massed in the ascus, dark in colour, 16–25 μ long, 8–12 μ thick.—*Lophothelium acervatum* Stirton in Scott. Nat. ix. 37 (1887) (see p. 383).

Not to be confused with *Discothecium stereocaulicola* Vouaux (Bull. Soc. Mycol. France xxix. 57 (1913)). *Microthelia stereocaulicola* Linds. (Trans. Roy. Soc. Edinb. xxv. 537 (1869)), which occurs on *Stereocaulon podetia* and has much smaller spores.

Hab.—On squamules of *Stereocaulon condensatum*.—B. M. Ben Lawers, Perthshire.

Ticothecium pygmæum Koerb. in Denkschr. Ges. Vaterl. Cultur. 236, t. 6, f. 12 (1853); Linds. *tom. cit.* 347; Massee in

Grevillea xvii. 5; A. L. Sm. *l. c.*—*Microthelia pygmæa* Koerb. Syst. Lich. Germ. 374 (1855); Mudd Man. 307.

Var. **ventosicolum** Wint. in Rabenh. Krypt. Fl. i. 2, 349 (1887); A. L. Sm. *l. c.*—*Microthelia ventosicola* Mudd Man. 307 (1861). *Sphæria ventosaria* Linds. in Trans. Roy. Soc. Edin. xxiv. 439 (1866). *Endococcus ventosus* Nyl. ex Cromb. Lich. Brit. 123 (1870). *Verrucaria ventosicola* Leight. Lich. Fl. 463; ed. 3, 495.

T. erraticum Massal. Symm. Lich. 94 (1855). Linds. *tom. cit.* 347; A. L. Sm. *l. c.*—*T. pygmæum* var. *erraticum* Vouaux *tom. cit.* 62. *Endococcus erraticus* Nyl. in Maine et Loire Mém. Soc. Acad. iv. 64 (1858); Cromb. Lich. Brit. 122. Subsp. *microphorus* Nyl. in Flora lxiv. 189 (1881); Cromb. in Journ. Bot. xx. 276 (1882). *Verrucaria erratica* Leight. Lich. Fl. 465; ed. 3, 496. (*Microthelia pygmæa* was included by Leighton as a synonym of *Verrucaria erratica*.)

T. cerinaria Berl. & Vogl. in Sacc. Syll. Add. i–iv. 120 (1886); Massee in *Grevillea* xvii. 5; A. L. Sm. Monogr. Lich. ii. 344. *Sphæria cerinaria* Mudd Man. 136 (1861). Very doubtful!

Phæospora rimosicola Zopf in Nova Acta Acad. Cæs. Leop.-Carol. lxx. n. 4, 263, (1898).—*V. peripherica* Tayl. in Mackay Fl. Hib. ii. 97 (1836)?; Leight. Angioc. Lich. 48 & 75, t. 21, fig. 2 & Lich. Fl. 449; ed. 3, 480? *V. Gagei* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. 37, t. iii. f. 10 (1854)? *V. rimosicola* Leight. *Exsicc.* 253 (1856) & Lich. Fl. 465; ed. 3, 496. *V. advenula* Nyl. in Flora xlviii. 606 (1865); Carroll in Journ. Bot. v. 260 (1867); Linds. in Quart. Journ. Microsc. Sci. n. ser. ix. 351 (1869); Cromb. Lich. Brit. 121. *V. triphractoides* Leight. Lich. Fl. ed. 3, 497 (1879). *Microthelia rimosicola* Mudd Man. 308 (1861). *M. peripherica* Mudd *l. c.*; Linds. *tom. cit.* 349. *Ticothecium rimosicolum* Arn. in Flora xlv. 678 (1861); Massee in *Grevillea* xvii. 4; A. L. Sm. Monogr. Lich. ii. 344. *Endococcus periphericus* Cromb. Lich. Brit. 123 (1870)? *E. triphractoides* Nyl. ex Cromb. in *Grevillea* iii. 24 (1874). *Pharcidia*? *triphractoides* A. L. Sm. *l. c.*

Ph. exoriens A. L. Sm.—*Endococcus exoriens* Stirton in Scott. Nat. v. 220 (1880). *Pyrenococcus exoriens* Wheld. & Wils. in Journ. Bot. Suppl. 69 (1915); A. L. Sm. Monogr. Lich. i. 482 (1918). (The spores are 3-septate and brown, measuring 9–11 μ \times 6 μ , considerably smaller than those of the preceding species. A. L. Sm. *l. c.* had suggested *Melanomma*, but the plant falls naturally into *Phæospora*.) (See p. 383.)

Ph. hetairizans Arn. in Flora lvii. 151 (1874).—*Verrucaria hetairizans* Leight. Lich. Fl. 462 (1871); ed. 3, 493.

Family PLEOSPORACEÆ.

Thelocarpon. Under this genus Vouaux (*tom. cit.* 84) has included as a fungus, *Thelocarpon epithallinum* Leight.; Linds. in Quart. Journ. Microsc. Sci. n. ser. ix. 345 (1869). (See p. 379.)

Didymella epipolytropa Berl. & Vogl. in Sacc. Syll. Add. 89 (1886).—*Thelidium epipolytropum* Mudd Man. 298 (1861); Linds. *tom. cit.* 346. *Verrucaria epipolytropa* Cromb. Lich. Brit. 121 (1870); Leight. Lich. Fl. 463; ed. 3, 494. *Microthelia verrucosaria* Linds. *tom. cit.* 349 (*fide* Vouaux *tom. cit.* 87). (Lindsay refers to description of a similar unnamed parasite on *Lecanora* sp. under *Aspicilia verrucosa* by Mudd Man. 165). *Didymosphæria epipolytropa* Wint. in Rabenh. Krypt. Fl. i. 2, 432 (1885); A. L. Sm. Monogr. Lich. ii. 344. (See *Thelocarpon*, p. 377.)

Didymosphæria microstictica Wint. in Hedwigia xxv. 25 (1886).—*Endocarpon microsticticum* Leight. *Exsicc.* 317; Linds. *tom. cit.* 351. *Verrucaria microstictica* Leight. Lich. Fl. 461 (1871); ed. 3, 493.

D. gelidaria A. L. Sm. Monogr. Lich. ii. 344 (1911).—*Sphæria gelidaria* Mudd Man. 130 (1861). *Ticothecium gelidarium* Berl. & Vogl. in Sacc. Syll. Add. 118 (1886); Massee in Grevillea xxii. 4.

Leptosphæria neottizans Zopf in Hedwigia xxxv. 361 (1896).—*Verrucaria neottizans* Leight. Lich. Fl. ed. 3, 497. Vouaux (*tom. cit.* 117) has suggested that *Microthelia bæomycaria* Linds. in Trans. Roy. Soc. Edin. xxv. 541, t. 24, f. 6 (1869) might be included here, but the description by Lindsay is inadequate for determination.

Pleospora ? addubitans A. L. Sm.—*Verrucaria addubitans* Stirt. in Scott. Nat. v. 220 (1880). *Polyblastia addubitans* Wheld. & Wils. in Journ. Bot. liii. Suppl. 71 (1915); A. L. Sm. Monogr. i. 483 (see p. 328).

DISCOMYCETES.

Family PATELLARIACEÆ.

Nesolechia. Under this genus Vouaux (*tom. cit.* 403 *et passim*) classifies *Lecidea vitellinaria*, *L. oxyspora*, *L. cladoniaria*, and suggests that *L. insita* may also be a member of the genus (see pp. 110–112).

Scutula. Under this genus Vouaux (*tom. cit.* 419 *et passim*) placed *Biatorina episema*, *B. cristata*, *B. stereocaulorum* and *B. epiblastematica* (see pp. 143–144), and *Arthonia peltigerea* (see p. 241). Keissler (Ark. Bot. xviii. n. 6, 8 (1923)) considers that the last mentioned is a species of *Conida* rather than of *Scutula*.

Mycobilimbia endocarpicola Vouaux *tom. cit.* 442.—*Lecidea endocarpicola* Linds. in Trans. Roy. Soc. Edinb. xxv. 547 (1869) as growing on *Endocarpon* sp.

Karschia. Several species of *Buellia* have been transferred to this genus by Vouaux (*tom. cit.* 442 *et passim*). *B. particularis* (see p. 200) has been entered under *Karschia athallina* Muell. Arg. Other British species transferred are *B. saxatilis* (p. 188), *B. scabrosa* (p. 195) and *B. advenula* (p. 200). *B. saxatilis* he

considers to be a parasite on the thallus of *Aspicilia calcarca*, *B. scabrosa* has been recorded by Lindsay as *Lecidea scabrosa* (Quart. Journ. Microsc. Sci. n. ser. ix. 135 (1869)), growing on or associated with *Baomyces rufus* and *B. placophyllus*, "sometimes only associated therewith."

Abrothallus parmeliarum (Sommerf.) Vouaux *tom. cit.* 464.—*Buellia parmeliarum* Oliv. (see pp. 199–200).

Leciographa parasitica (see p. 201). This species has been listed by Vouaux (*tom. cit.* 474) as *L. inspersa*. All species of *Leciographa* are parasitic on other lichens (see p. 201). *L. glaucomaria* (p. 202) is quoted by Lindsay (*tom. cit.* 136) under parasitic *Lecideae*.

Mycobacidia flavovirescens as *Bacidia* (see p. 179), *M. plumbina* (*Leciographa plumbina*, see p. 202), *M. vermifera* (*Melaspilea vermifera*, see p. 251) are recorded by Vouaux *op. cit.* xxx. 139 as fungi.

Family CELIDIACEÆ.

Conida clemens Massal. Misc. Lich. 46 (1856); Linds. Quart. Journ. Microsc. Sci. n. ser. ix. 142 (1869); Vouaux *op. cit.* xxx. 149 (1914).—*Arthonia subvarians* Nyl. (see p. 241).

C. galactinaria Vouaux *tom. cit.* 152.—*Arthonia galactinaria* as synonym of *A. subvarians* (see p. 241).

C. punctella Arn.; A. L. Sm. Monogr. Lich. ii. 345 (1911); Vouaux *tom. cit.* 152.—*Arthonia punctella* Nyl.; Linds. *tom. cit.* 144 (see also p. 241).

C. epiphorbia Vouaux *tom. cit.* 163.—*Lecidea epiphorbia* Stirton (see p. 111).

C. fuscopurpureum Vouaux *tom. cit.* 161.—*Celidium fuscopurpureum* Linds. *tom. cit.* 141 (as microlichen).

Celidium varium Linds. *tom. cit.* 141; Vouaux *tom. cit.* 171.—*Arthonia glaucomaria* as synonym of *A. varians* (see p. 240).

C. varians Vouaux *tom. cit.* 176.—*Arthonia varians* Nyl. (see p. 240); Linds. *tom. cit.* 143, pro parte.

C. stictarum Tul. Mém. Lich. 121 (1852); Linds. *l. c.*—Fungus recorded by Lindsay as a microlichen.

SPHÆROPSIDEÆ.

Dendrophoma alcicornaria Vouaux *op. cit.* xxx. 283 (1914).—*Microthelia alcicornaria* Linds. *tom. cit.* 349 (as microlichen).

Diplodina solorinaria Vouaux *tom. cit.* 289.—*Microthelia solorinaria* Linds. *tom. cit.* 350 (as microlichen).

ADDENDA AND CORRIGENDA

P. 122. Under *Biatorella simplex* delete citation *Exsicc. Johns. n. 419* (transferred to *Acarospora veronensis*, p. 401).

P. 165, line 5 : read *Trans. Linn. Soc. vii. 94, t. 8, f. 4* (1804), instead of *viii.* (1807).

P. 356. Under maritime species, before n. 22, insert the following :—

Arthopyrenia gyalectoidea Knowles, sp. nov. Thallus pallidus vel stato humido flavo-brunneus. Perithecia numerosa, minuta, immersa, madore flavo-brunnea; pyrenio dimidiato; paraphyses graciles, ramosæ; sporæ 4–8^{nae} in ascis oblongis, oblongo-ovoideæ, 1-septatæ, 12–15 μ long, 5 μ thick.

Thallus light-coloured, light-yellow-brown when moist, algal cells yellow (*Trentepohlia*). Perithecia minute (about .2 mm. wide), thickly scattered on the surface, deeply immersed, yellow-brown when moist; perithecial wall dimidiate; paraphyses slender, branched; asci 58–70 μ long, 12–15 μ wide, often bent at the base; spores usually 4, but sometimes 8 in ascus, 1-septate, oblong-ovoid, 12–15 μ long, 5 μ thick, lower cell tapering; hymenial gelatine tawny-red with iodine.

Distinguished by the brown perithecia; in the dry state they are sunk below the orifices, giving the lichen a gyalectoid appearance; with moisture they swell up and fill the cavities, the yellow-brown tops of the perithecia becoming level with the well-marked rims of the orifices.

Hab. Growing in little hollows on the surface of flat limestone rocks (white chalk with flint). *Distr.* Between neap tides, near the Harbour, Ballycastle, Co. Antrim, associated with *Verrucaria mucosa* and *Arthopyrenia halodytes*.—*B. M.* Ballycastle, Antrim.

APPENDIX TO PART I

THE genera and species described below are emendations or additions to Part I (published in 1918). Their place in the text is indicated.

Family I. **CALICIACEÆ.**

After *Stenocybe byssacea*, p. 20, add :—

Stenocybe bryophila Wats. in Journ. Bot. lxiii. 130 (1925).—Thallus little evident, obsolete or none proper. Apothecia stalked, 1–1.5 mm. long, dark or greyish, often with a bluish tinge, somewhat shining, especially at margin of disc; capitulum clavate-truncate, with the margin of the disc inflexed; paraphyses not very evident, sometimes showing as more or less entangled hyaline filaments; ascus cylindrical, about 350 μ long, 25 μ wide, narrowed at base, bluish with iodine; spores 8 in the ascus, dark-brown, obliquely 1-seriate, 3-septate with paler and smaller end-cells, 35–40 μ long, 12–15 μ thick; asci and paraphyses bluish with iodine.

Hab. On stems of Hepatics on rocks or trees.—*B. M.* Cwm-y-glo, Llanberis (on rocks, W. Watson), Cennant Mawr, Nantygwrhyd, Snowdonia (on alder, D. A. Jones), Carnarvonshire.

Family IV. **PYRENOPSISIDACEÆ.**

After *Psorotichia pyrenopsoides*, p. 42, add :—

Psorotichia lugubris Dal. Tor. & Sarnth Flecht. Tirol. 592 (1902); A. L. Sm. Monogr. i. 487.—Thallus indeterminate, thickish, minutely squamulose, granulose-concrete, breaking up into crumb-like portions, brownish or chocolate-grey (K —, CaCl —); hypothallus black. Apothecia generally scattered, small or submoderate, superficial, plane, margined, black, the margin thickish, prominent, entire, occasionally subflexuose, persistent; paraphyses slender, very loosely coherent, thickened at the apices, the epithecium dark-green; hypothecium blackish-brown; spores spherical or subspherical, halonate, 8–9 μ diam. (or 12–15 $\mu \times 9$ –12 μ); hymenial gelatine bluish with iodine.—*Lecidea lugubris* Sommerf. Suppl. Fl. Lapp. 143 (1826), pro parte; Nyl. in Bot. Not. 176 (1852); Linds. in Quart. Journ. Microsc. Sci. v. 177, t. 11 (1857); Cromb. Lich. Brit. 85; Leight. Lich. Fl.

255; ed. 3, 246; A. L. Sm. Monogr. i. 16. *Schæreria lugubris* Koerb. Syst. Lich. Germ. 232 (1855); Mudd Man. 213, t. 4, f. 78.

Exsicc. Cromb. n. 91; Mudd n. 183.

The species was doubtfully included under *Lecidea*, but the gonidia (*Gloecapsa* sp.) place it in Pyrenopsidaceæ. The thallus, which usually spreads extensively, is composed of minute crowded sublobulate squamules; these are larger, planer and more scattered when the plant is muscicolous. Spermogones, not often visible, are punctiform, black, with short cylindrical straight spermatia.

Hab. On rocks and boulders, granitic and schistose, rarely incrusting mosses in mountainous districts.—*Distr.* N. Wales, N. England and among the Grampians, Scotland.—*B. M.* Cader Idris, Merioneth; Ayton, Kildale Moor, Cleveland and Cronkley Scar, Yorkshire; High Force, Teesdale, Durham; Ben Lawers, Craig Tulloch and Glen Fender, Blair Athole, Perthshire; Morrone Braemar, Aberdeenshire.

Var. lugubrior A. L. Sm.—Thallus more or less minutely granular, effuse, not squamulose, dark-greyish or -brownish on a black hypothallus. Apothecia scattered, black, small, with a thick tumid margin; spores uniseriate in the ascus, with a very thick border almost cuboid at first from compression, about 12 μ in diameter. *Lecidea lugubris* var. *lugubrior* A. L. Sm. Monogr. Lich. ii. 17 (1911).

The specimens in the British Museum were collected from one locality. One of them Nylander had recognized as distinct from, though closely allied to, the species, and had given it (in MS.) the specific name adopted for the variety.

Hab. On the schistose stones of an old wall.—*B. M.* Glen Fender, Blair Athole, Perthshire.

Family XIII. **LECANORACEÆ.**

After *Lecanora polytropa*, p. 301, *add* :—

L. actophila Wedd. in Mém. Soc. Sci. Nat. Cherb. xix. 268 (1875).—Thallus rather thin, squamulose-areolate, the areolæ small scattered or generally contiguous and subeffigurate at the circumference, pale greenish-grey (K —, CaCl —). Apothecia rather rare, small (less than $\frac{1}{2}$ mm. in diam.), sessile on the thallus, the disc black with a stoutish grey thalline margin; hypothecium colourless; paraphyses confluent, dull-blue at the tips; spores ellipsoid, 8–14 μ long, 5–6 μ thick; hymenial gelatine blue with iodine (?).

Considered by Weddell to be allied to *L. polytropa*. He and others describe a greenish-black hypothallus, which is not present in our specimen. The latter was collected by D. A. Jones and P. G. M. Rhodes (July 1925) and sent to T. Hebden, who identified it as the above; it is new to the British Flora. The reaction with iodine has not proved satisfactory.

Hab. On rocks on shore near high-water mark.—*B. M.* Llandanwg, Merioneth.

Acarospora, p. 333.—A monograph of the genus *Acarospora* has recently been published by A. H. Magnusson in Göteb. K. Vet.-och Vitt.-Samh. Handl. xxviii. 2, 1-149, 3 pls. (1924). A continuation of this work appeared in Svensk. Bot. Tidsk. xviii. 329-342 (1924). We owe cordial thanks to Dr. Magnusson for giving us the results of his examination of the British Museum specimens during a visit to London in 1925. He has found changes in nomenclature—and in some instances in determination—to be necessary, and has delimited a number of species not hitherto recognized by British lichenologists.

The results of his work, so far as they affect the British Lichen Flora, are as follows :—

Instead of **Acarospora squamulosa** Th. Fr. (p. 333), read :—

Acarospora macrospora Th. Fr. Lich. Arct. 88 (1860).—Magnusson rejects the generally accepted *A. squamulosa*, which was based on Schrader's *Lichen squamulosus*, as that lichen has, according to Arnold (Flora lxiii. 378 (1880)), a distinctly red reaction with CaCl. The more recent citations by Acharius and others only partly belong to that plant, hence the adoption of *Myriospora macrospora* (K —, CaCl —) Hepp Exs. 58 (1855) as the type specimen. Schrader's *L. squamulosus* with the positive C reaction belongs doubtfully to *A. peliocypha* (see p. 338).

Form **albomarginata** has been identified as var. *incusa* Magn. —*A. castanea* f. *incusa* Koerb. Parerg. 59 (1859).

A. glaucocarpa (p. 334).

Var. **depauperata**.—Magnusson distinguishes three forms in this variety : (1) f. *depauperata* Koerb.—thallus almost obsolete, apothecial margin thick and more brightly coloured than the disc ; (2) f. *sarcogynoides* (Wain.),—thallus obsolete, the apothecia with a reddish margin, though passing over to f. *depauperata* ; and (3) f. *melaniza* (Nyl.),—thallus obsolete and apothecia pruinose.

A. smaragdula (p. 336).

The chemical reaction of this species has unfortunately been given in British text-books as K —, CaCl — ; it is now limited to specimens that react K + red or reddish : a reaction recorded by Magnusson only in this species, in *A. Lesdainii* and in *A. subrufula*. He notes also that the under side is pale, thus separating off *A. subrufula*, in which the under side is dark. He considers it as probably a nitrophilous species growing freely where dust accumulates.

A. smaragdula var. **sinopica** (p. 337).

This variety is treated by Magnusson as a species, *A. sinopica* Koerb. Syst. Lich. Germ. 156 (1855) (excl. var. *smaragdula*).—A very distinctive plant owing to the infiltration of the thallus by ferric oxide. The areolæ are as a rule more contiguous than in

A. smaragdula and sometimes placodioid-lobate at the circumference. There is no chemical reaction with K or with CaCl, thus differing from *A. smaragdula*.

A. Lesdainii (p. 334).

The thallus of this species as originally described gave the reaction K + red. Magnusson in his Key to species contrasts it with *A. smaragdula* (K + red) thus:—

Thallus thin, plane, K + red. Apothecia regular ... *A. smaragdula*
Thallus thick, uneven, K — or yellowish. Apothecia irregular

A. Lesdainii

There is some misapprehension in Magnusson's description, as Harmand based it on the reaction, K + red. It is, however, distinct in "the thinner flattened areolæ with small irregular apothecia" (Magnusson *in litt.*).

A. scyphulifera Wain. Lich. Pitlekai in Ark. Bot. viii. n. 4, 147 (1909).—Thallus thin rimulose or areolate, the areolæ round or angulose, dispersed or more or less contiguous, forming a thin crust, varying in colour from pale reddish-brown to testaceous or pale and dirty ferruginous, firmly attached to the stone (K —, CaCl —), the under surface often darkened by particles from the stone. Apothecia numerous, single or few in each areola, the disc dark-brown, concave, 2–4 mm. broad with a thick dark-brown margin; asci 75 μ long, 13–15 μ wide; paraphyses coherent; rather slender, not capitate; spores 2–3.5 μ long, 1.5 μ thick; hymenium 125–150 μ high, yellowish-brown above, blue then wine-red with iodine. —Magn. in Göteb. K. Vet.-och Vitt.-Samh. Handl. xxviii. 2, 57 (1924).

Magnusson notes that the apothecium forms a flattened cup, mostly superficial on the thallus.

Hab. On mica-schist rock.—*B. M.* Foxdale, I. of Man. Magnusson has considered that this specimen collected by J. Hunter is probably the above species. It had been included under *A. glaucocarpa*, but differs in the hymenium, which in *A. glaucocarpa* is only 65–75 μ high and is persistently blue with iodine.

A. verruciformis Magn. *tom. cit.* 58.—Thallus brown, subsquamulose-areolate, the areolæ semi-globose or verrucose, loosely adherent, 1–3 mm. broad, dark-brown in the centre, the margins light brown, mostly dispersed, some contiguous or conglomerate in the cracks of the stone (K —, CaCl —). Apothecia one or two in each areola, 2–4 mm. wide, round, immersed, blackish-brown with a dark-brown to blackish margin, and concave or plane disc; paraphyses coherent, slender; spores 3–4 μ long, 1.5 μ thick; hymenium 120–200 μ high, somewhat brownish-yellow, brownish upward, intensely dark-blue with iodine.

Similar to *A. smaragdula* in the scattered partly light-coloured squamules, but differs in the absence of chemical reaction and in the

somewhat high hymenium, which in *A. smaragdula* is 125–150 μ or sometimes 175 μ high. Our specimen was classified by Crombie under *Lecanora discreta*.

Hab. On rocks, and evidently a nitrophilous species.—*B. M.* Teesdale, Durham.

Instead of *A. percænoides* (p. 335), read—*A. cervina* Massal. Ric. Lich. 28 (1852).

Magnusson emphasizes the upturned white lower surface giving a white margin to the squamules. Apothecia rather rare in our specimen from Yatton, more abundant in *A. cervina* f. *percænna* Magn. from Teesdale, are usually minute or up to 1–2 mm. broad; the hymenium 65–75 μ high, dark-blue with iodine.

We have two specimens belonging to this species—both included under *A. percænoides*. Magnusson has distinguished the one from Teesdale (in Mudd's herbarium) as f. *percænna*.

***A. fuscata* (p. 335).**

Magnusson distinguishes seven forms of this species, two of which are represented in the British Museum:—f. *flavescens* from Charnwood Forest, Leicestershire, with paler yellow or yellow-brown squamules; and f. *macra*, in which the thalline areolæ are dispersed and thin. Under the latter form he places *Lecanora discreta* Johns. Exs. 151, and the following specimens, transferred from *A. smaragdula*: near Ayton, Cleveland, Yorkshire; near Hexham, Northumberland; King's Park, Stirling. These are all distinguished by the reaction $\text{CaCl} + \text{red}$, a character of *A. fuscata*, and not detected (*vide* Magnusson) in any other British species, except *A. peliocypha*.

***A. peliscyphoides* (p. 336).**

Magnusson *tom. cit.* 97 quotes *A. peliscyphoides* Oliv. as a synonym of *A. peliocypha*. Our specimen, from Portlethen, Kincardine, has the thallus as described, though of a deeper red colour. Magnusson has labelled it as a pachythalline form of *A. fuscata*, and not *A. peliocypha*.

After *A. fuscata* (*l. c.*) add:—

Acarospora opaca Magn. in Svensk. Bot. Tidsk. xviii. 337 (1924).—Thallus areolate, obscurely brown, opaque, the areolæ dispersed or some contiguous, usually angulose, separated by cracks, dark reddish-brown, rather plane and even, with the margin more or less free from the stone ($\text{K} -$, $\text{CaCl} -$), the lower surface blackish. Apothecia minute, numerous, impressed or level with the thallus, more or less concolorous with the thallus, 2–5 in each areola, round, immarginate; hypothecium more or less distinctly yellowish; hymenium colourless 90–110 μ high, pale blue with iodine; paraphyses discrete more or less distinctly capitate, the epithecium brownish-yellow; asci about 50–60 μ long, 15 μ wide; spores numerous, ellipsoid 3–4 μ long, 1.5 μ thick.

“Pycnidia” minute, not rare, the conidia punctiform $1\ \mu$ long, $0.7\ \mu$ thick.

Evidently scarcely differing from *A. fuscata*, the original specimen was included by M. C. Knowles under that species (Sci. Proc. Roy. Dublin Soc. xiv. 131, (1913)). According to Magnusson it differs from *A. fuscata* in the absence of C reaction, the opaque, not lobate and dark areolæ, and in the shape of the apothecia. The hymenium in *A. fuscata* is $70\text{--}100\ \mu$ high.

Hab. On slaty siliceous rock, on the shore.—*B. M.* Llandanwg and Y. Fegli Vawr, near Barmouth, Merioneth (the latter specimen named as above by Magnusson is Leighton's *Lecanora admissa* Nyl., and was included with *A. discreta* (Monogr. i. 338–339)); Howth, Dublin (the type locality).

After *A. fuscata* (p. 335) add :—

A. badiofusca Th. Fries Lich. Arct. 90 (1860).—Thallus verrucose-areolate, grey- or dark-reddish-brown, the areolæ $.5\text{--}1.5$ mm. wide or larger, $.3\text{--}.75$ mm. thick, somewhat slimy or opaque, scattered or more or less contiguous or rarely almost coherent, sometimes slightly wrinkled, the margin and under side usually dark (K —, CaCl —). Apothecia few, or seldom abundant, concave with steep margins, finally superficial or elevated, round or angulose by pressure $.4\text{--}1.5$ mm. wide, the disc pale reddish-brown or reddish-black, becoming plane or finally convex and rough, the thalline margin distinct, or disappearing; paraphyses distinct, stout, the tips brownish and slightly swollen; asci and spores not always well developed; spores $3\text{--}4\ \mu$ long, $1.5\text{--}2\ \mu$ thick; hymenium $60\text{--}75\ \mu$ high, blue, the upper $10\ \mu$ yellowish-brown, with iodine.—*Lecanora badiofusca* Nyl. Herb. Mus. Fenn. 110 (1859) & Lich. Scand. 174.

Magnusson (*in litt.*) remarks on the one apothecium in our specimen (labelled *Lecanora admissa*), which is about 4 mm. broad and irregularly sublobate.

Hab. On schistose or granitic stone.—*B. M.* Ben Lawers, Perthshire.

A. Normanii Magnusson in Göteb. K. Vet.-och Vitt.-Samh. Handl. xxviii. 2, 118 (1924).—Thallus areolate, dark reddish-brown, the areolæ dispersed or a few contiguous, opaque, $.5\text{--}1.5$ mm. broad, $.5\text{--}.7$ mm. thick, round or angulose by pressure and separated by deep cracks (K —, CaCl —). Apothecia numerous, $1\text{--}5$ in each areola, at first impressed, punctiform, then dilated, the disc concave or plane, dark-brown, slightly wrinkled when old, with a thin disappearing margin; paraphyses coherent, stoutish (ca. $2.5\ \mu$ thick), not capitate; spores $3\text{--}5\ \mu$ long, $1.5\text{--}2\ \mu$ thick; hymenium $75\text{--}100\ \mu$ (or $120\ \mu$) high, reddish-brown upwards, dirty wine-red to greenish-blue with iodine.

Considered by Magnusson to be near to *A. veronensis* or to *A. badiofusca* var. on account of the colour, etc., but differing in the type of cortex, which consists in the higher layer of upright hyphæ. The

specimen from Barcaldine was recorded under *A. smaragdula*; the one from Staveley under *A. squamulosa*.

Hab. On schistose rocks.—*Distr.* Rare in high latitudes.—*B. M.* Black Lot, Staveley, Westmorland; Barcaldine, Argyll.

A. Magnussoni Samp. ex Magnusson in Svensk. Bot. Tidskr. xviii. 341 (1924).—Thalline areolae dispersed in the inequalities of the stone or rarely a few contiguous .5–1 mm. broad, .4–.6 mm. thick, blackish-brown or dark pitch coloured, more or less irregularly round, depressed verruciform, opaque or slightly shining, widely affixed to the substratum, lower side of the margin blackish (K —, CaCl —). Apothecia mostly single, or sometimes 2–4 in one areola, impressed, more or less irregularly round, the disc .2–.4 mm. broad, concolorous with the thallus, concave, surrounded by the thallus as a thick slightly elevated, indistinctly limited margin; hymenium 150–200 μ high, blue or brownish-red or dark-brown upwards with iodine; paraphyses slender, dark-capitate; spores more or less oblong 4–5 μ long, 1.5–1.7 μ thick.—*Endocarpon rufo-virescens*, Tayl. in Fl. Hib. ii. 100 (1836) pro parte. *E. smaragdulum* var. *rufo-virescens* Leight. Angioc. Lich. 16 (1851) pro parte.

This plant, first reported from Portugal by Sampaio, is described as "without accompanying lichens." Our plant from Dunkerron determined by Magnusson is mixed with squamules similar to those of *A. smaragdula*, and these are included by Taylor in his description "pale yellowish-green scales." Taylor's name "*rufo-virescens*" might be considered to take precedence of the recent *A. Magnussonii*, but his description partly refers evidently to *A. smaragdula*, as he himself allows, and is otherwise imperfect.

Hab. On granitic uneven stones.—*B. M.* Dunkerron, Kerry.

After *A. smaragdula* (p. 336) add :—

A. subrufula Oliv. Lich. d'Europe ii. 79 (1909).—This species was described by Nylander as "thallus squamulose, lurid-reddish," and as differing from *Lecanora smaragdula* in the more developed apothecia, paraphyses stouter and septate, and in the slightly larger spores 4–5 μ long, 1.5–1.8 μ thick.—*Lecanora smaragdula* subsp. *subrufula* Nyl. in Flora lxii. 355 (1879).

Magnusson notes (*in litt.*)—"it is well separated from *A. smaragdula* by the beautiful reddish colour of the thallus (K + red), with the underside dark; the usually single apothecia, the low hymenium, constantly dark-blue with iodine and the slightly larger spores."

Magnusson adds that *A. subrufula* may be recognized by the habitat. The specimens in the British Museum determined by him were included under *A. fuscata*.

Hab. On siliceous rocks (sandstone or conglomerate).—*B. M.* Jersey; Alderney; Buckstone, near Monmouth.

A. fusca B. de Lesd. Lich. Dunk. Suppl. 100 (1914).—Thallus dusky-brown, squamulose, closely adhering to the substratum by slender fastigiate hyphae, the squamules small, .3–.6 mm. wide,

scattered or contiguous, roundish or often variously angulose, somewhat smooth, beneath white (K —, CaCl), the cortex amorphous, but surmounted by brown capitate hyphæ. Apothecia roundish or oblong, one or sometimes 2–3 in the areolæ, .15–.2 mm. wide, at first immersed then becoming plane with a thin thalline margin, the disc plane, smooth; paraphyses rather coherent, subcapitate, fuscate; spores oblong, 3–4 μ long, 1–1.5 μ thick; hymenial gelatine blue with iodine.

The original specimen occurred on slate on the sand-dunes, Malo. In the specimen from Essex (which was included under *A. smaragdula*), the hymenium is rather high (about 200 μ). Magnusson (*in litt.*) considers that *A. fusca* is nearly akin to *A. smaragdula* and to *A. Lesdainii*, perhaps only a variety of either of them.

Another darker specimen on the same mount from Beeleigh, Essex, he has noted as “uncertain and belonging to the *rufescens* group, possibly a new species.” The hymenium is not so high (about 80 μ) but the capitate brown paraphyses are very marked.

Hab. On siliceous stones.—*B. M.* Near railway bridge, Langford, Essex.

A. æquatula Magnusson in Göteb. K. Vet.-och Vitt.-Samh. Handl. xxviii. 2, 128 (1924).—Thallus continuous, cracked-areolate, thin or rather thick, dark-reddish-brown, surface on the whole even, but areolæ uneven as if composed of minute squamules (K —, CaCl —). Apothecia small, one (or few?) in each areola .2–.5 mm. wide, slightly impressed, becoming plane, concolorous with the thallus, with an inconspicuous margin; hypothecium dark-yellowish; paraphyses coherent, slender, the tips wider and brown (3–4 μ wide); asci abundant; spores 3–4 μ long, 1.5–2 μ thick; hymenium 100–125 μ high, blue or, in thin section, red with iodine.

Our specimens had both been determined as *Lecanora rufescens*, and were included under *A. smaragdula*, from which they differ in the absence of K reaction and in the flattened continuous thallus.

Hab. On siliceous rocks.—*B. M.* Dolgelly, Merioneth; Appin, Argyll.

A. Muddii Magnusson in Medd. Göteb. Bot. Trädgård ii. 72 (1925).

“Areolæ towards the centre globulose-verrucose, very unequal in size and shape, somewhat widely affixed to the substratum. Cortical cell-lumina large, 3–6 μ wide, cortical and medullary hyphæ with thin walls. Apothecia 1 to 3 in each areola, impressed, the disc .1–.3 mm. wide without a thalline margin; hymenium 115–125 μ high, blue or reddish with iodine; paraphyses brownish-capitate; spores somewhat broadly ellipsoid, 3–4 μ long, 1.5–1.7 μ thick (perhaps not well developed).”

This species has so far only been found in Britain: the specimens were regarded by Mudd as *A. cervina* var. *rufescens*, and the difference between them and other *Acarosporæ* was discovered by Dr. Magnusson and published in a paper entitled “New or Misunderstood European

Lichens. "We are indebted to the author for an early intimation of this publication.

"*A. Muddii* seems to be nearly related to *A. æquatula*, but is separated through the unevenly verrucose thallus and the sunk apothecia." The above description has been kindly sent by A. H. Magnusson. The specimens had been classified in our herbarium under *A. smaragdula*. The species was discovered by Magnusson on his recent visit to London.

Hab. On arenaceous rocks.—*B. M.* Ayton, Cleveland, Yorkshire.

A. discreta (p. 338).—Under this species was included *Lecanora admissa* Nyl.; one specimen bearing that name has been transferred by Magnusson to his new species *A. opaca*, *q. v.* The specimens listed under *A. discreta* have now been included under an earlier name *A. veronensis* by Magnusson, who considers also that the species differs from *A. admissa*, as the apothecia in the latter, at first impressed, become plane and usually rise above the surface, while in *A. veronensis* they are deeply impressed and without distinct margin.

A. veronensis Massal. Ric. Lich. 29 (1852).—Thallus chestnut-brown or dark reddish-brown, the areolæ thin or turgid, often scattered or a few contiguous, pallid beneath, round or by pressure somewhat angulose (K —, CaCl —). Apothecia numerous, sometimes single or several in each areola, round or elongate, deeply impressed, mostly without a distinct margin, generally .15–2 mm. (rarely .4–5 mm.) wide, the disc generally concolorous with the thallus; hymenium 65–75 (–100) μ high, wine-red with iodine; paraphyses coherent, slender, the tips swollen, 3 μ wide, yellowish-brown; spores 3–4 μ long, 1.5 μ thick.—Magn. *tom. cit.* 129.

Ersicc. Johns. n. 419 (as *Lecanora simplex* f. *herpes*, and included under *Biatorella simplex*).

Magnusson, as stated, has replaced *A. discreta* by *A. veronensis*. He finds that it grows in places rich in nitrogen near the road or houses or on stones where birds usually sit.

Hab. On stones.—*B. M.* St. Bees, Cumberland; The Khoil, Ballater, Braemar, Aberdeenshire.

A. rufescens Magnusson *tom. cit.* 134 (excl. syn. Engl. Bot.)—Thallus usually contiguous, rather thin, pale reddish-brown, areolate, the areolæ 0.5–1 mm. broad, round or angulose by pressure (K —, CaCl —), lower side pale. Apothecia mostly single or few in each areola, round, with usually concave disc, darker than the prominent obtuse thalline margin. The internal structure resembles that of *A. veronensis*.—*Sagedia rufescens* (Turn.) in Ach. Lich. Univ. 329 (1810). *Lecidea rufescens* Borr. in Engl. Bot. Suppl. 2657 (1831).

This species has been considered (p. 337) to be synonymous with *A. smaragdula*. There are two specimens in the British herbarium from Turner, collected at Gorleston, Suffolk; the one in the Salwey

Herbarium is labelled by Salwey *Urceolaria rufescens* as well as *Sagedia* and *Lecidea rufescens* E.B. 2657. It had been referred to Nylander and bears in his handwriting *Lecanora rufescens* (Ach.). That specimen is the one considered by Magnusson as the type of *Acarospora rufescens*, with no reaction from CaCl.

The second Turner specimen, also from Gorleston, labelled *Sagedia rufescens*, is from the Sowerby Herbarium. It is evidently the specimen which Borrer published as *Lecidea rufescens* (Engl. Bot. 2657). It gives the reaction CaCl + red and otherwise agrees with *A. fuscata*.

Family XV. THELOTREMACEÆ.

After *Thelotrema* (p. 380) add :—

58a. **CONOTREMA** Tuck. Syn. N. Amer. Lich. i. 217 (1882). (Pl. 63.)

Thallus crustaceous, membranaceous, uniform; algal cells Protococcaceæ. Apothecia urceolate, immersed, truncate-conoid, at first closed then open, becoming plane, proper margin black, thalline margin thin, soon disappearing; spores long, cylindrical, colourless, multiseptate. Spermatogones with simple sterigmata and oblong straight spermatia.

This genus is classified in Thelotremaceæ on account of the urceolate, double-walled apothecium. The spores are very distinctive.

1. **C. urceolata** Tuck. l. c.—Thallus glaucous, white or greyish, smooth, becoming wrinkled or cracked, membranaceous, limited by a black line. Apothecia small, black, urceolate, becoming sessile and prominent, whitish-pruinose or naked, with a thick, elevated margin; hypothecium blackish; paraphyses slender, lax, branched above, colourless; spores 8 in the ascus, elongate-cylindrical, maggot-like, somewhat arcuate, 30–40-septate, 100–160 μ long, 3–5 μ thick.—*Lecidea urceolata* Ach. Lich. Univ. 671 (1810); Cromb. in Journ. Bot. xiii. 141 (1875); Leight. Lich. Fl. ed. 3, 361.

Hab. On the bark of rather smooth trees.—*Distr.* Rare, only recorded from W. Scotland.—*B. M.* Airds, Appin, Argyll.

2. **C. homalotropa** A. L. Sm.—Thallus white, smooth, very thin, subdeterminate. Apothecia black, moderate, urceolate, becoming plane, prominent, with a thick elevated margin; hypothecium thin, blackish; paraphyses slender, lax, branched above, colourless; epithecium dusky, subrugose; spores 8 in the ascus, colourless, elongate-cylindrical, multiseptate, the septa at slightly irregular intervals, 130–140 μ long, 45–50 μ thick.—*Lecidea homalotropa* Nyl. in Flora l. 329 (1867); Cromb. Lich. Brit. 90; Leight. Lich. Fl. 337; ed. 3, 361.

Very closely resembles the preceding, but differs slightly in the apothecia, which are generally plane, larger and somewhat rugose.

Hab. On the bark of old ash trees.—*Distr.* Local and rare in S.W. Ireland.—*B. M.* Between Killarney and Kenmare, and on Eagle's Island, Lake of Killarney, Kerry.

Family XVA. **CHRYSOTHRICACEÆ.****Crocynia** (p. 385).

The genus *Crocynia* is widely distributed, but is seldom found in fruiting condition. Hitherto the only fertile species known was *C. gossypina* Nyl. from the West Indies. In a *Monographia Crocyniarum* begun by Abbe Hue, and now completed and published by Dr. Bouly de Lesdain (Bull. Soc. Bot. France, 1924, 311-402), a second fertile specimen, *C. antecellens* Hue, is recorded from the Auvergne in Central France, where it was collected by B. de Lesdain on the trunk of an old chestnut tree.

In the monograph 115 mostly new species and many varieties and forms are diagnosed at great length by Hue or by B. de Lesdain, a few of them previously recorded as *Lepra* or *Iepraria* spp. Among these, 8 species and 3 varieties are described from Great Britain, from specimens sent by lichenologists in this country. Only one species, *C. lanuginosa*, had previously been distinguished. It would be extremely difficult to recognize species from the published descriptions, but the method of classification as outlined by B. de Lesdain is here given, and the position in the synopsis of our species indicated. In the preliminary key the species are arranged thus:—

I. Hyphæ entirely white.

A.—*Gonidia* protococcoidea.

Hyphæ anastomosing.

,, not anastomosing.

B.—*Gonidia* cystococcoidea.

Hyphæ anastomosing.

,, not anastomosing.

C.—*Gonidia* chroolepoidea.

Hyphæ anastomosing.

,, not anastomosing.

D.—*Gonidia* pleurococcoidea.

Hyphæ anastomosing.

II. Lower hyphæ coloured.

A.—*Gonidia* protococcoidea.

Hyphæ anastomosing.

,, not anastomosing.

B.—*Gonidia* cystococcoidea.

Hyphæ anastomosing.

,, not anastomosing.

C.—*Gonidia* chroolepoidea.

Hyphæ anastomosing.

,, not anastomosing.

III. Hyphæ above the gonidia forming a kind of cortex.

A.—*Gonidia* protococcoidea.

Hyphæ anastomosing.

In view of much modern work on green algæ and on lichen gonidia, we are at once in a difficulty as to the distinction between the algal groups cited. The leading characteristics of the British species or varieties are noted, with distribution and collectors as given in the text; they have been placed by Lesdain according to the key as follows:—

I. A. Hyphæ anastomosing.

C. fragilis B. de Lesd. *tom. cit.* 330.—Thallus whitish or greyish, fragile, vaguely and minutely squamulose, the hyphæ with obscure red corpuscles.

(Red corpuscles on *Crocynia* hyphæ have been noted elsewhere as of animal origin.)

Hab. On decayed mosses or rocks.—*Distr.* Clapham, Yorkshire; near Cramond, Corstorphine and Liberton, Midlothian (MacAndrew).

C. rigidula B. de Lesd. *tom. cit.* 331.—Thallus whitish not fragile, crustaceous, covering the mosses (K + yellowish).

Hab. On decayed mosses on rocks.—*Distr.* Pitlochry, Perthshire (MacAndrew).

C. Andrewii B. de Lesd. *tom. cit.* 332.—Thallus greyish, soft, very fragile, spongy, occurring in small scattered granules, or con crescent and sinuate at the circumference.

Hab. On mosses.—*Distr.* Gisburn, Yorkshire (MacAndrew).

C. mollissima B. de Lesd. *l. c.*—Thallus dull-white soft, very fragile, spongy, crustaceous broadly expanded, mostly continuous, sinuate at the circumference.

Hab. Among mosses on calcareous rocks.—*Distr.* Clapham Craven, Yorkshire (Hebden).

Hyphæ not anastomosing.

C. tephra Hue *tom. cit.* 341.—Thallus ash-grey soft, fragile in solitary granules or a few united, indeterminate.

Hab. On mosses or walls.—*Distr.* Balerno, Midlothian (MacAndrew).

II. A. Hyphæ anastomising.

C. lanuginosa (p. 385) var. **inactiva** B. de Lesd. *tom. cit.* 356.

The authors recognize six varieties and one form of this, hitherto, the only British species. Lesdain remarks, however, that var. *inactiva* is of small importance as the reaction K—, is variable.

Hab. On decayed mosses.—*Distr.* Pitlochry, Perthshire (MacAndrew).

f. **stricta** B. de Lesd. *tom. cit.* 359.—The meshes formed by the hyphæ very narrow.

Hab. On living mosses.—*Distr.* Invermoidart, Argyll (Macvicar).

Var. **albescens** B. de Lesd. *tom. cit.* 362.—Thallus white.

Hab. On rocks.—*Distr.* Aberfoyle, Perthshire (MacAndrew).

C. saxicola B. de Lesd. *tom. cit.* 366.—Thallus white, of small scattered fragments.

Hab. On mosses on rocks.—*Distr.* Bursall (?) and Clapham, Yorkshire (MacAndrew).

Var. **inactiva** B. de Lesd. *tom. cit.* 358.—Thallus of smaller more disconnected granules.

Hab. On mosses on rocks.—*Distr.* Near Edinburgh (MacAndrew).

C. scotica B. de Lesd. *tom. cit.* 390.—Thallus white, stiff and friable, squamulose.

Hab. On moss cushions.—*Distr.* Corstorphine Hill, near Edinburgh (MacAndrew).

II. B. Hyphæ anastomosing.

C. anglica B. de Lesd. *tom. cit.* 994.—Thallus white or greyish, soft, fragile, occurring in granules or suberustaceous.

Hab. On decayed mosses on walls.—*Distr.* Liberton and Balerno, Midlothian (MacAndrew).

Family XVII. CLADONIACEÆ.

After **Bæomyces rufus** var. **Prostii**, p. 404, *add* :—

Hab. On turfy bank in moist wood.—*B. M.* Near old Weir Bridge, Killarney, Kerry (Rhodes, Aug. 1924).

After **Stereocaulon coralloides**, p. 410, *add* :—

St. subcoralloides Nyl. in *Flora* lviii. 6 (1874).—Differs from *St. coralloides* in the chemical reaction of the medulla of the podetium, K —. In *St. coralloides* it is K + yellow.—*St. paschale* f. *subcoralloides* Nyl. *Lich. Scand.* 64 (1861); Wain. in *Medd. Soc. Faun. & Fl. Fenn.* ii. 43 (1878).

The specimen (included under *St. coralloides*) was determined by A. H. Magnusson (June 1925) as belonging to this rather rare northern species. In addition to the absence of K reaction with potash, the lichen is marked by the more slender and delicate form both of the podetia and the podetial squamules.

Hab. On soil on rocks.—*B. M.* Ravensdale, Derbyshire (Herb. Holl).

GLOSSARY

- ABRADED (Lat. *abrado*, to rub away), rubbed or scraped off.
 ACERVULATE (Lat. *accrevus*, a heap), heaped up—ACERVULI.
 ACICULAR (Lat. *acus*, a needle), slender, needle-shaped.
 ACUMINATE (Lat. *acumen*, a point), coming gradually to a point.
 ADNATE (Lat. *adnascor*, to grow to), adhering to anything.
 ADRESSED (Lat. *ad*, to, *pressus*, kept under), lying flat.
 ADSPERSED (Lat. *adpersus*), scattered.
 ÆRUGINOSE (Lat. *ærugo*, the rust of brass), blue-green colour of verdigris.
 AFFIXED, fixed to or upon.
 AGGLUTINATE (Lat. *agglutino*, to glue on to), glued together.
 AGGREGATE (Lat. *aggregatus*, assembled), crowded, not confluent.
 ALECTORIOID, like the genus *Alectoria*.
 ALGOID, similar to algæ.
 AMPHITHECIUM (Gr. *amphi*, around, *theke*, a case), the thalline margin of the apothecium, *cf.* thalloid exciple.
 AMYLACEOUS (Gr. *amylon*, fine flour), starchy.
 ANAPHYSES (Gr. *ana*, up, *phusis*, growth), peculiar sterigmatoïd filaments in the apothecium of *Ephebeia*.
 APICULATE (Lat. *apex*, the end or point), terminating in a small point.
 APICULUS (Lat., a little point), a sharp, short point.
 APOTHECIUM (Gr. *apo*, up, *theke*, a case) open disc-shaped fructification.
 APPENDICULATE (Lat.), with small appendages.
 APPLANATE (Lat. *ad*, to, *planatus*, made flat), flattened or horizontally expanded.
 APPRESSED, *cf.* adpressed.
 ARACHNOID (Gr. *arachne*, a spider), like a spider's web.
 ARCUATE (Lat. *arcus*, a bow), bent like a bow, curved.
 ARDELLÆ (Gr. *ardo*, to sprinkle), spot-like apothecia of *Arthoniaceæ*.
 AREOLA (Lat. *area*, a space), a small space marked out on the surface of crustaceous lichens.
 ARTHONIOID, applied to apothecia like those of the genus *Arthonia*.
 ARTHROSTERIGMA (Gr. *arthron*, a joint, *sterigma*, a prop), septate sterigmata.
 ARTICULATE (Lat. *articulus*, a joint), septate.
 ASCUS (Gr. *askos*, a wine skin), an enlarged cell in which the spores are developed, usually the terminal end of a hypha.
 ASCYPHOUS (Gr. *a*, without, *skuphos*, a cup), without scyphi, *q.v.*
 ASPERSED, *cf.* adpersed.
 AXIL (Lat. *axilla*, the arm-pit), the angle between the axis and any organ arising from it.
 AXIS (Lat., an axle), the central strand of tissue or main stalk round which the organs are developed.

- BACILLAR (Lat. *bacillum*, a staff), rod- or club-shaped.
 BADIO-, BADIOUS (Lat.), chestnut-brown.
 BÆOMYCETOID, like the genus *Bæomyces*.
 BIATORINE, with soft or waxy apothecia, often brightly coloured, without a thalline margin, as in *Biatora*.
 BIFID (Lat. *bis*, twice, *findo*, *fidi*, *findere*, to cut), divided in two.

- BILOCULAR (Lat. *bi*-, *bis*-, twice, *loculus*, a compartment), having two cells.
- BISERIATE (Lat. *bi*-, twice, *series*, a succession), in two rows.
- BOTRYOSE (Gr. *botrus*, a bunch of grapes), branched like a cluster of grapes.
- BULLATE (Lat. *bull*-, a bubble), blistered or puckered.
- BYSSINE, BYSSOID (Lat., *byssus*, fine flax), like the old genus *Byssus*, slender and thread-like.
- CÆSIOUS (Lat.), bluish-grey.
- CÆSPITOSE (Lat. *cæspes*, a sod), growing in tufts.
- CANALICULATE (Lat. *canaliculus*, a small channel), with longitudinal channel or furrow.
- CANCELLATE (Lat.), latticed.
- CAPILLARY (Lat. *capillus*, a hair), slender and hair-like.
- CAPITATE (Lat. *caput*, head), formed into or having a head.
- CAPITULUM, fructification of *Calicie*, a globose apical apothecium.
- CARBONACEOUS (Lat. *carbo*, charcoal), black, like charcoal.
- CARIOSE, CARIOUS (Lat.), rotten, decayed.
- CARIOSO-CANCELLATE, becoming latticed by decay.
- CARNEOUS (Lat. *caro*, *carnis*, flesh), flesh-coloured.
- CARTILAGINOUS (Lat. *gristly*), hard and tough like a cartilage or sinew.
- CEPHALODIA (Gr. *kephale*, a head), abnormal developments upon or within the lichen-thallus, usually inducing irregular outgrowths which contain blue-green (rarely bright-green) algæ.
- CEPHALODINE, forming a head or cephalodium.
- CERANOID (Gr. *keras*, a horn, *eidos*, like), having horn-like branches.
- CERVINE (Lat. *cervus*, a stag), dark-tawny in colour.
- CHINE, crack or cleft in the thallus, *cf.* *rima*.
- CHONDROID (Gr. *chondros*, cartilage), hard and tough, like cartilage, applied to a closely compact medulla, with the hyphæ arranged longitudinally and cohering to form a solid axis.
- CHROOLEPOID, like the genus *Chroolepis* (*Trentepohlia*), with yellow gonidia.
- CHRYSOSONIDIA (Gr. *chrysos*, gold, *gonos*, offspring), yellow-coloured algal cells belonging to the genus *Trentepohlia*.
- CILUM (Lat., an eyelash), marginal hair on thallus or fruits—CILIATE.
- CINNABARINE (Gr. *kinnabari*, a red pigment), scarlet-coloured.
- CIRCUMCISS (Lat.), having a circular fissure.
- CITRINE (Lat. *citrus*), greenish or lemon-yellow.
- CLAVATE (Lat. *clavus*, a club), club-shaped, enlarging upwards.
- COARCTATE (Lat. *coarctatus*, strangled), constricted.
- COLLICULOSE (Lat. *colliculus*, a little hill), covered with little round elevations.
- COMPLANATE (Lat. *complanatus*, levelled), flattened, compressed.
- COMPLICATE (Lat.), folded together.
- CONCATENATE (Lat. *con*, together, *catena*, a chain), joined together like the links of a chain.
- CONCEPTACLE (Lat. *conceptaculum*, a receptacle), a cavity within which reproductive cells are produced.
- CONCOLOROUS, similar in colour.
- CONCRESCENT (Lat. *concreresco*, to grow together), growing together.
- CONCRETE (Lat. *concretus*, grown together), closely adhering.
- CONGLOMERATE (Lat. *con*, together, *glomus*, a ball), clustered.
- CONGLUTINATE (Lat. *conglutino*, to glue), glued together.
- CONNATE (Lat. *connatus*, born at the same time), growing together.
- CONNIVENT (Lat. *connivens*, winking), coming into contact, converging.
- CONSTIPATE (Lat.), crowded together.
- CONTIGUOUS (Lat. *contiguus*, adjoining), the separate parts of the thallus touching and continuous.
- CONTINUOUS, having an unbroken surface.
- CONVOLUTE (Lat.), rolled round.
- CORALLOID (Lat. *corallum*, coral), of a coral-like structure.

- CORIACEOUS (Lat. *corium*, leather), leathery.
 CORNEOUS (Lat. *cornu*, a horn), horny.
 CORNICULATE, CORNUTE, horn-shaped.
 CORONATE (Lat. *corona*, a crown), formed like a crown.
 CORRUGATE (Lat.), wrinkled, rough with wrinkles.
 CORTEX (Lat., bark or rind), the outer layer of the thallus—CORTICAL, CORTICATE.
 CORTICOLOUS (Lat. *cortex*, the bark, *colo*, to inhabit), living on the bark of trees.
 CORYMBOSE (Gr. *korumbos*, a cluster of fruit or flowers), arranged in clusters.
 COSTATE (Lat. *costa*, a rib), ribbed.
 CRENATE, CRENULATE (Lat. *crena*, a notch), scalloped or with rounded notches on the margin.
 CRISPATE (Lat. *crispus*, curled), curled and twisted.
 CRISTATE (Lat. *crista*, a crest or terminal tuft), crested.
 CRUSTACEOUS (Lat. *crusta*, rind or shell), hard, thin, brittle; applied to a closely adhering thallus without cortical layers.
 CUCULLATE (Lat. *cucullus*, a hood), hooded or hood-shaped.
 CUPULAR (Lat. *cupula*, a little cup), cup-shaped—CUPULE.
 CYATHOID (Gr. *kuathos*, a wine cup, *eidōs*, like), cup-shaped.
 CYLINDRICAL (Gr. *kulindros*, a cylinder), elongate and circular in cross-section.
 CYPHELLA (Gr. *kuphella*, the hollows of the ears), a minute cup-like hollow on the under-surface of the thallus of *Stictia*—CYPHELLATE.
 DACTYLINE, DACTYLOID (Gr. *dactylos*, a finger), spreading like fingers.
 DECOLORATE (Lat.), colourless.
 DECUMBENT (Lat., reclining), reclining, but ascending at the apex.
 DECUSSATE (Lat. *decusso*, to divide crosswise), of the thallus divided and crossed by dark lines.
 DEHISCENT (Lat. *dehisco*, to split open), ruptured or split open.
 DENDRITIC, DENDROID (Gr. *dendron*, a tree), having a branched appearance.
 DENIGRATE (Lat.), blackened.
 DENTATE (Lat. *dens*, a tooth), toothed at the margin.
 DENUATE (Lat.), stripped, made bare or naked.
 DEPAUPERATE (Lat.), impoverished as if starved.
 DEPLANATE (Lat.), flattened or expanded.
 DETERMINATE (Lat., bounded), with a definite outline.
 DICHOTOMOUS (Gr. *dichotomeo*, to cut in two), forked.
 DIFFORM (Lat. *dis*, apart, *forma*, shape), of unusual form.
 DIFFRACT (Lat., broken), broken into areolæ.
 DILACERATE (Lat.), torn asunder.
 DIMIDIATE (Lat. *dimidiatus*, halved), applied to the perithecial wall when it covers only the upper half of the perithecium.
 DIŒCIOUS (Gr. *dis*, two, *oikos*, a house), having the male and female organs on different individuals.
 DIRINEAN, similar to the genus *Dirina*.
 DISCOID (Gr. *diskos*, a quoit, *eidōs*, like) disc-like.
 DISCOLOROUS, of a different colour.
 DISCRETE (Lat. *discretus*), separate and distinct.
 DISSECTED (Lat. *dissectus*, cut up), deeply divided.
 DISTICHOUS (Gr. *distichos*, of two rows), disposed in two rows.
 DIVARICATE (Lat., spread asunder), spreading in opposite directions.

E, Latin prefix; usually signifying without, as epruinose, esquamulose, efoliolose.

EFFIGURATE (Lat. *e*, out of, *figura*, a figure), having a distinct form or figure.

EFFUSE (Lat. *effusus*, poured out), spread out in an indeterminate way.

- ELLIPTICAL, ELLIPSOID, shaped like an ellipse; oblong with rounded ends.
- EMARGINATE (Lat. *emargino*, to deprive of its edge), having a notch cut out.
- ENDEMIC (Gr. *en*, in, *demos*, a country district), confined to a given region.
- ENDOCARPOID, applied to perithecia which are sunk in the substance of the thallus, as in *Endocarpon*.
- EPITHLÆODAL (Gr. *epi*, upon, *phloios*, bark), applied to the thallus when growing on the outside of the bark.
- EPISPORE (Gr. *epi*, upon, *spora*, seed), the outer spore-coat.
- EPITHALLINE, applied to a spuriously thalline apothecial margin.
- EPITHECIUM (Gr. *epi*, upon, *theke*, a case), the layer covering the thecium or hymenium.
- ERODED, EROSE (Lat. *erosus*, gnawed), as though bitten or gnawed.
- ERUMPENT (Lat. *e*, out of, *rumpere*, to break), immersed then bursting outwards.
- EUGONIDIA (Gr. *eu*, well, *gonos*, offspring), bright-green gonidia (*Chlorophyceæ*).
- EVERNIFORM, like the genus *Evernia* (with a strap-shaped thallus).
- EXASPERATE (Lat. *exaspero*, to make rough), rough with hard projecting points.
- EXCIPLE, EXCIPULUM (Lat. *excipula*, a basin), term used for the hypothecium or for that part of the thallus in which the fruit is embedded (receptacle), or for the tissue surrounding the fruit.
- EXPLANATE (Lat. *explanatus*), spread out.
- FARINACEOUS, FARINOSE (Lat. *farina*, meal), with a mealy surface.
- FASCICULATE (Lat. *fascis*, a bundle), growing in a close bundle or cluster.
- FASTIGIATE (Lat. *fastigium*, a slope or gable), with branches parallel, clustered and erect, sometimes decreasing in height outwards like the gable of a house.
- FATISCENT (Lat. *fatisco*, to open in chinks), cracked or falling apart.
- FAVEOLÆ, FAVEOLATE (Lat. *farus*, a honeycomb), honey-combed.
- FERRUGINOUS (Lat. *ferrum*, iron), rust-coloured.
- FIBRILLÆ (Lat. *fibra*, a fine thread), minute fibre-like branches—FIBRILLOSE.
- FILAMENTS (Lat. *filum*, a thread), thread-like constituents of the thallus—FILAMENTOUS, FILIFORM.
- FIMBRIATE (Lat.), fringed.
- FISTULOSE (Lat. *fistula*, a pipe), hollow.
- FLACCID (Lat. *flaccidus*), flabby, limp.
- FLEXUOSE, FLEXUOUS (Lat. *flexus*, bent), wavy.
- FOLIACEOUS (Lat. *folium*, a leaf), flat and leaf-like.
- FOLIOLOSE (Lat. *folium*, a leaf), consisting of minute lobes.
- FORNICATE (Lat., arched), of the thalline apices, arched and hood-like.
- FOVEOLATE (Lat. *fovea*, a small pit), pitted.
- FRUTICOSE, FRUTICULOSE (Lat. *frutex*, a shrub), having the thallus attached by a single basal point, cylindrical, filamentous or strap-shaped.
- FUCOID (Gr. *phukos*, seaweed, *oidos*, like), resembling seaweed.
- FULIGINOUS (Lat. *fuligo*, soot), brown verging on black, soot-coloured.
- FURCATE (Lat.), forked.
- FURCELLATE (Lat. *furcula*, a little fork), minutely forked.
- FURFURACEOUS (Lat. *furfur*, bran), scurfy.
- FUSCOUS (Lat. *fuscus*, dark), of a dingy-brown colour.
- FUSIFORM (Lat. *fusus*, a spindle, *forma*, shape), long and tapering towards each end—FUSOID.
- GEMINATE (Lat. *gemini*, twins), in pairs.
- GENICULATE (Lat. *genu*, the knee), bent like the knee.
- GIBBOUS (Lat. *gibbus*, a hump), with hump-like swellings.
- GLABROUS (Lat. *glaber*, without hair), with a hairless surface.
- GLAUCCOUS (Gr. *glaukos*, bluish-grey), sea-green or greyish-blue like the bloom on a plum or cabbage.

- GLEBULOSE (Lat. *gleba*, a clod), with rounded elevations on the thallus.
- GLOMERULES (Lat. *glomus*, a ball), a minute ball-like cluster—GLOMERULATE.
- GLYPHOLECINE (Gr. *glyphe*, carving, *lekis*, a dish), with wavy or labyrinthine fruits as in the genus *Glypholecia*.
- GONIDIMIUM, an algal-cell of small size such as occurs in the hymenium of some *Pyrenocarpei*.
- GONIDIUM (Gr. *gonos*, offspring), a green algal cell (*Chlorophyceæ*), constituent of the lichen thallus.
- GONIMIUM (Gr. *gonimos*, productive), a blue-green algal cell (*Cyanophyceæ*), constituent of the lichen thallus.
- GRANULATE, GRANULAR, GRANULOSE (Lat. *granum*, a grain), consisting of minute particles.
- GRISEOUS (Lat.), grey.
- GUTTÆ (Lat. *gutta*, a drop), oil-drops in spore cells—GUTTULATE, *cf.* nucleolate.
- GYALECTOID, applied to urceolate waxy apothecia, resembling those of the genus *Gyalecia*.
- GYMNOTREMOID (Gr. *gymnos*, naked, *trema*, a hole, *eidos*, like), with a bare open spot or space.
- GYROSE (Lat. from Gr. *gyros*, round), curved backward and forward in turn.
- HALONATE (Gr. *halos*, the disk of the sun, halo), surrounded by an outer circle.
- HAPLOGONIDIA (Gr. *haploos*, single), gonidia occurring singly.
- HAPLOGONIMIA (Gr. *haploos*, single), gonimia occurring singly.
- HETEROMEROUS (Gr. *heteros*, other, *meros*, a part), fungal and algal constituents in definite strata in the thallus.
- HISPID (Lat., bristly), beset with rough hairs or bristles.
- HOMOIOMEROUS (Gr. *homaios*, like, *meros*, a part), fungal and algal constituents more or less mixed in the thallus.
- HORMOGONIMIUM (Gr. *hormos*, a necklace), gonimia arranged in chains as in *Nostoc*, *cf.* moniliform.
- HYMENIUM (Gr. *hymen*, a membrane), the layer of tissue in the apothecium, consisting of asci and paraphyses, *cf.* thecium.
- HYPHA (Gr. *hyphe*, a web), a fungal filament.
- HYPOPHLEODAL (Gr. *hypo*, under, *phloios*, bark), applied to thallus when growing within the bark.
- HYPOTHALLUS (Gr. *hypo*, under, *thallus*, a sprout), the undergrowth of thalline hyphæ visible at the edge of the thallus.
- HYPOTHECIUM (Gr. *hypo*, under, *theke*, a case), the layer below the thecium or hymenium.
- IMBRICATE (Lat. *imbricatus*, covered with tiles), overlapping like the tiles on a roof.
- IMPRESSED (Lat. *impressus*, pressed into), marked with slight depressions.
- INCISED (Lat., cut into), cut sharply into the margin.
- INCRASSATE (Lat. *incrassatus*, thickened), stout or thickened.
- INDETERMINATE, without a definite outline, *cf.* effuse.
- INFUNDIBULIFORM (Lat. *infundibulum*, a funnel), shaped like a funnel.
- INFUSCATE (Lat. *infusco*, to make dusky), of a brownish colour.
- INNATE (Lat. *innatus*, born in), embedded in the thallus.
- INSCULPT (Lat. *insculptus*, engraved), cut into, forming holes or depressions.
- INSPERSED (Lat. *inspersus*, spread about), interpenetrated with granules.
- INTRICATE (Lat.), entangled.
- ISABELLINE, "Isabella" colour, a dirty-tawny tint.
- ISIDIIFEROUS (Lat. *fero*, I bear), thallus bearing isidia, *q.v.*
- ISIDIUM (Gr. *isis*, a coral, *eideos*, like), a coral-like outgrowth on the lichen thallus, rounded at the top, resembling the old genus *Isidium*.

JOINTED, septate.

- LACERATE (Lat. *lacer*, mangled), torn or irregularly cleft.
- LACINIA (Lat. *lacinia*, a fragment of cloth), a slender thalline lobe.
- LACINIATE, thallus cut into narrow lobes.
- LACUNA, LACUNOSE (Lat. *lacuna*, a hollow cavity), having depressions or holes.
- LEVIGATE (Lat.), smooth as if polished.
- LAGENIFORM (Lat. *lagena*, a flask), shaped like a Florence flask.
- LATERAL (Lat. *latus*, a side), fixed on or near the side of thallus or apothecium.
- LECANORINE (*Lecanora*, a genus of lichens), applied to apothecia with a thalline margin as in the genus *Lecanora*.
- LECIDEINE (*Lecidea*, a genus of lichens), applied to apothecia which are carbonaceous, usually dark-coloured and without a thalline margin, as in *Lecidea*.
- LENTICULAR, LENTIFORM (Lat. *lens*, a lentil), lentil- or lens-like, doubly convex.
- LEPRARIOID (Gr. *lepra*, leprosy), with a whitish mealy or scurfy surface like the old form genus *Lepraria*—LEPROSE.
- LEPTOGIROID, similar to the genus *Leptogium*.
- LEPTOGONIDIA (Gr. *leptos*, delicate, *gonos*, offspring), algal cells of small size, cf. *gonidium*.
- LIGNICOLE, LIGNICOLOUS (Lat. *lignum*, wood, *colo*, to inhabit), living on wood or trees.
- LIRELLA (Lat. *lira*, a ridge between two furrows), a long narrow apothecium with a ridge down the middle—LIRELLÆFORM.
- LIVID (Lat.), of a leaden colour, pale and clouded.
- LOBATE (Gr. *lobos*, the lower part of the ear), thallus divided into lobes—LOBULATE.
- LOCULUS, LOCULAR (Lat., a little place), a compartment of a septate spore.
- LURID (Lat. *luridus*, sallow, wan), dull, or dingy in colour.
- LUTEOUS (Lat. *luteus*, gold-coloured), a full yellow-colour.
- MACRO-, Greek prefix, signifying large.
- MACROPHYLLINE (Gr. *makros*, large, *phyllon*, a leaf), having large lobes.
- MACULAR (Lat. *macula*, a spot), applied to a thallus occurring in spots.
- MARGINAL, situate on the edge or margin.
- MARGINATE, having a margin, term applied to apothecium.
- MASTOID (Gr. *mastos*, a breast, *eidos*, like), nipple-like.
- MAZÆDIUM, fructification of *Calicci*: spores free from the asci forming a powdery mass in almost closed heads.
- MEDULLA (Lat. *pith*), the loose hyphal layer in the interior of the thallus.
- MEMBRANACEOUS, thin, like a membrane.
- MICRO-, Greek prefix, signifying small.
- MICROPHYLLINE (Gr. *mikros*, small, *phyllon*, a leaf), composed of minute lobes or scales.
- MINIATE (Lat. *miniatus*), coloured like red lead or cinnabar.
- MONILIFORM (Lat. *monile*, a necklace), in rows, like a string of beads.
- MONO-, Greek prefix, signifying one.
- MONŒCIOUS (Gr. *monos*, one, *oikos*, a house), with male and female organs on the same plant.
- MONOPHYLLOUS (Gr. *monos*, one, *phyllon*, a leaf), one-leaved.
- MONOTYPIC (Gr. *monos*, one, *typos*, a type), having only one exponent, as a genus with one species.
- MUCUS, MUCOSE (Lat. *mucus*, nasal secretion), mucilaginous.
- MULTI-, Latin prefix, signifying many.
- MULTIFID (Lat.), cleft into many lobes or segments.
- MURAL-DIVIDED, MURIFORM (Lat. *murus*, a wall), term applied to multicellular spores that are divided like the masonry of a wall.
- MUSCICOLE (Lat. *muscus*, moss, *colo*, to inhabit), living on mosses.
- MYCELIUM (Gr. *mukes*, a mushroom), an aggregate of fungal hyphæ.
- MYRIOSTORED (Gr. *myrios*, many, *spora*, a seed), with many spores.

- NODULE** (Lat. *nodus*, a knot), a small knot or rounded body.
- NOSTOCINE** (*Nostoc*, a genus of *Cyanophyceæ*), similar to *Nostoc*.
- NUCLEAR** (Lat. a *kernel*), sometimes signifying closed perithecia.
- NUCLEOLATE**, applied to spores that have conspicuous oil-drops, *cf.* guttulate.
- OB-**, Latin prefix, signifying in an inverse direction, as obconical, obovate.
- OBLONG**, longer than broad, with nearly parallel sides.
- OBSELETE** (Lat. *obsoletus*, worn out), wanting or rudimentary.
- ÔCHROLEUCOUS** (Gr. *ochra*, yellow earth, *leukos*, white), yellowish-white.
- OLEOSO-LOCULAR** (Lat. *oleum*, oil, *loculus*, a little compartment,) applied to spores with cells like drops of oil.
- ORBICULAR** (Lat., circular), a flat body with a circular outline.
- OSSEOUS** (Lat.), bone-like.
- OSTIOLE** (Lat. *ostium*, a little door), the opening in the perithecium through which the spores escape.
- OVAL** (Lat. *ovum*, an egg), shaped like an egg—**OVATE**, **OVIFORM**, **OVOID**.
- PALMATE** (Lat. *palma*, the palm of the hand), lobed in a finger-like manner.
- PANNIFORM** (Lat. *pannus*, a cloth), having the appearance of felt or woollen cloth—**PANNOSE**.
- PAPILLA** (Lat., a nipple), a small superficial protuberance.
- PAPULOSE** (Lat. *papula*, a pimple), beset with pimples or pustules.
- PARAPHYSIS** (Gr. *para*, beside, *phusis*, growth), a sterile filament in the hymenium growing alongside the asci.
- PARATHECIUM** (Gr. *para*, beside, *theke*, a case), the layer immediately surrounding the thecium, continuation of the hypothecium.
- PARIETAL** (Lat. *paries*, a wall), belonging to a wall.
- PARMELEINE**, resembling the genus *Parmelia*, a term applied to shield-like apothecia—**PARMELOID**.
- PATELLULATE** (Lat. *patella*, a small dish), applied to sessile marginate apothecia, resembling a little dish.
- PATENT** (Lat. *patens*, open), spreading, as of branches.
- PATULOUS** (Lat.), spreading.
- PAUCI-**, Latin prefix signifying few.
- PEDICELLATE** (Lat. *pediculus*, a small foot), borne on a stalk.
- PELTATE** (Lat. *pelta*, a small shield), orbicular and horizontal, in the form of a shield or target—**PELTIFORM**.
- PENDULOUS** (Lat.), hanging.
- PERI-**, Greek prefix, signifying about, or outer covering, as perigonidium.
- PERIDIUM** (Gr. *peridion*, a little pouch), the covering of the upper part of a closed pyrenocarp, sometimes used for the whole fructification.
- PERIPHERAL** (Gr. *periphēreia*, the circumference of a circle), surrounding.
- PERIPHYESES** (Gr. *peri*, about *phusis*, growth), filaments rising near the mouth of the perithecium.
- PERITHECIUM** (Gr. *peri*, about, *theke*, a case), a roundish fructification entirely enclosed or with a minute opening at the apex.
- PERTUSARIOID**, like the genus *Pertusaria*, with the apothecia occurring in verticæ, *q.v.*
- PERVIOUS** (Lat. *pervius*, passable), referring to scyphi that are open or perforate at the base.
- PINNATE** (Lat. *pinna*, a feather), lobes arranged on each side of a common axis.
- PINNATIFID** (Lat. *findo*, *fidi*, to cut), pinnately cut.
- PISTILLAR** (Lat. *pistillum*, a pestle), club-shaped.
- PISTILLARI-BACILLAR**, term applied to spermatia which are oblong and slightly thicker at the ends.
- PLACODIOID**, like the genus *Placodium*, with the thallus orbicular, adpressed, lobed at the circumference.
- PLATYGONIDIA** (Gr. *platus*, broad, *gonos*, offspring), gonidia in broadly spreading groups (*Cephaleuros*).

- PLATYPHYLLOUS (Gr. *platys*, broad, *phyllon*, a leaf), broadly lobed.
- PLICATE (Lat. *plico*, to fold), folded in plaits—PLICIFORM.
- PLURI-, Latin prefix signifying many.
- PLURILOCULAR, many-celled.
- PODETUM (Gr. *pous*, *podos*, a foot), a stalk-like thalline elevation supporting an apothecium.
- POLARI-BILOCULAR, of two-celled spores with a thick central wall traversed by a connecting tube, the lumen of the cells at the extreme ends. Also termed placodiomorph, blastenio-spore, oreuliform.
- POLY-, Greek prefix signifying many.
- POLYMORPHOUS (Gr. *polus*, many, *morphe*, a form), with several or various forms.
- POLYPHYLLOUS (Gr. *polus*, many, *phyllon*, a leaf), many-leaved.
- PROLIFEROUS (Lat. *proles*, offspring, *fero*, to bear), bearing offshoots.
- PROPER MARGIN, the rim or margin encircling the apothecium, as distinct from the thalline margin.
- PROTOCOCCOID, like the genus *Protococcus*.
- PRUINA (Lat., hoar-frost), powdery secretion or bloom on the surface of plants—PRUINOSE.
- PSEUDO- (Gr. *pseudos*, false), used as a prefix signifying false or spurious.
- PULVERACEO-DELITESCENT (Lat. *pulvis*, powder, *delitescere*, to lie hid), covered with a layer of powdery granules.
- PULVERULENT (Lat. *pulvis*, powder), powdery.
- PULVINATE (Lat. *pulvinatus*, cushion-shaped), thallus growing in cushion-like masses.
- PULVINULUS, a small cushion-like outgrowth.
- PYCNIDE (Gr. *puknos*, dense), a closed fructification containing stylo-spores.
- PYRENium (Gr. *pyren*, a kernel), the outer wall of a perithecium or sometimes of a fructification.
- PYRENOCARP (Gr. *carpos*, fruit), a closed fructification (perithecium) opening above by a pore or slit.
- PYRENOIDEINE (PYRENODINE), (Gr. *oides*, like), a term applied to perithecia—PYRENOID.
- PYRENOPSIDIAN, similar to the genus *Pyrenopsis*.
- PYRIFORM (Lat. *pyrus*, a pear), pear-shaped.
- RADIATE (Lat. *radius*, a ray or the spoke of a wheel), spreading outwards from a centre.
- RADIUS, RADII, the outermost lobes or squamules.
- RAMOSE (Lat. *ramus*, a branch), branching.
- RAMULI, branchlets or secondary branches.
- RAPHIDES (Gr. *raphis*, a needle), needle-shaped crystals.
- RECEPTACLE (Lat. *receptaculum*, a reservoir), term used for the base or surrounding tissue of the apothecium.
- RENIFORM (Lat. *renis*, a kidney), kidney-shaped.
- REPAND (Lat., bent backwards), with an uneven margin, less so than sinuous.
- RETICULATE (Lat. *rete*, a net), resembling a net-work.
- RETUSE (Lat. *retusus*, blunted), with a shallow notch in a rounded apex.
- REVOLUTE (Lat. *re*, back, *volvo*, to roll), rolled back from the margin or apex.
- RHAGADIOSE (Gr. *rhagas*, a chink), cracked or fissured.
- RHIZINA, pl. RHIZINÆ (Gr. *rhiza*, a root), root-like strands or hairs.
- RIMA (Lat., a cleft), a chink or cleft—RIMOSE. RIMULOSE.
- RIMOSE, diffract, widely cracked or chinked.
- RIVULOSE (Lat. *rivus*, a stream), having sinuate channels or lines.
- ROSULATE (Lat. *rosa*, a rose), collected into a rosette.
- ROTUNDATE (Lat. *rotundus*, round), rounded.
- RUBRICOSE (Lat. *ruber*, red), reddish.
- RUGOSE, RUGULOSE (Lat. *ruga*, a wrinkle or fold), wrinkled.
- SACCATE (Lat. *saccus*, a bag), swollen, sack-shaped.
- SANGUINEOUS (Lat.), blood-red.

- SAXICOLE, SAXICOLOUS** (Lat. *saxum*, a rock, *colo*, to inhabit), growing on rocks or stones.
- SCABRID, SCABROUS** (Lat.), rough with minute elevations.
- SCROBICULATE** (Lat. *scrobiculus*, a little trench), marked with small pits.
- SCUTELLATE** (Lat. *scutella*, a salver), shaped like a platter—**SCUTELLIFORM**.
- SCYPHUS** (Gr. *skuphos*, a cup), a cup-like dilatation of the podetium in lichens on the edges of which are borne the apothecia—**SCYPHIFEROUS** (**SCYPHIPHOROUS**), bearing scyphi.
- SECOND** (Lat. *secundus*, second or following), with parts directed to one side only.
- SEPTATE** (Lat. *septum*, a fence or enclosure), divided by a partition or cell-wall.
- SESSILE** (Lat. *sessilis*, sitting), without any stipe or stalk.
- SETACEOUS** (Lat. *seta*, a bristle), slender, bristle-like—**SETULIFORM**.
- SINUATE** (Lat. *sinus*, a curve), with a deep wavy margin.
- SINUS** (Lat., a curve or fold), a recess or re-entering angle.
- SIROSPHOID**, resembling the genus *Sirosiphon* (*Stigonema*), where the cells occur usually in two or more rows.
- SMARAGDINE** (Gr. *smaragdos*, an emerald), emerald or dark-bluish-green.
- SORDID** (Lat. *sordidus*, fouled), dirty in tint.
- SPADICEOUS** (Gr. *spadix*, a palm-branch), bright date-brown in colour.
- SPEIROGONIMIA** (Gr. *speiro*, to sow, to scatter), gonimia scattered.
- SPERMATIUM** (Gr. *sperma*, a seed), a spore-like body formed in the spermogone, regarded as a non-motile male cell or as a spore.
- SPERMOGONE** (Gr. *sperma*, a seed, *gonos*, offspring), closed receptacle containing spermatia.
- SPHINCTRIFORM**, like the genus *Sphinctrina* (apothecia almost sessile).
- SPINOSE, SPINULOSE** (Lat. *spina*, a thorn), beset with spines.
- SPONGIOSE** (Lat. *spongia*, a sponge), soft and spongy.
- SPORE** (Gr. *spora*, a seed), a reproductive body which becomes free and germinates to form a new plant.
- SPURIOUS** (Lat. *spurius*, illegitimate), counterfeit, apparent but not real.
- SQUAMULE** (Lat. *squama*, a scale), a small thalline lobe.
- STELLATE, STELLATO-** (Lat., starry), star-shaped or radiating like the rays of a star.
- STERIGMA**, pl. **STERIGMATA** (Gr. *sterigma*, a prop), the stalk (spermatophore) from which the spermatia are abjoined.
- STIPATE** (Lat.), crowded.
- STIPES** (Lat., a trunk of a tree), stalk—**STIPITATE**.
- STRAMINEOUS** (Lat. *stramen*, straw), straw-coloured.
- STRATUM** (Lat.), a layer of tissue.
- STRIATE** (Lat. *stria*, a furrow), marked with parallel lines or ridges—**STRIATULATE**.
- STRUMOSELY** (Lat. *struma*, a scrofulous tumour), with cushion-like swellings.
- STYLOSPORE** (Gr. *stulos*, a column, *spora*, a seed), a spore borne on a filament.
- SUB-**, Latin prefix, signifying under, below or partly.
- SUBICULUM** (Lat., an underlayer), a felted undergrowth of hyphæ.
- SUBULATE** (Lat. *subula*, an awl), shaped like an awl.
- SULCATE** (Lat.), furrowed or grooved.
- SUTURE** (Lat. *sutura*, a seam), a line of opening.
- SYMBIONT** (Gr. *sun*, with, *bios*, life), one of two dissimilar organisms living together.
- SYMBIOSIS, SYMBIOTIC**, a living together of dissimilar organisms, with mutual benefit, also styled commensalism, consortism, individualism, and mutualism.
- SYMPHICARPOUS, SYMPHYCARPOUS** (Gr. *sumphuo*, to grow together, *carpos*, fruit), with confluent apothecia.
- SYNGONIMIA** (Gr. *sun*, with), gonimia united in clumps.
- TARTAREOUS**, resembling tartar, having a more or less rough crumbling surface, or thickish, and almost smooth.
- TEREBRATE** (Lat. *terebræ*, a borer), with scattered perforations.

- TERMINAL** (Lat. *terminare*, to limit), on the end of a stalk or branch.
TERRICOLOUS (Lat. *terra*, the earth, *colo*, to inhabit), living on soil.
TESSELLATE (Lat. *tessella*, a small square piece of stone), resembling a tessellated pavement.
TESTACEOUS (Lat. *testa*, a brick or tile), brick-red.
THALAMIUM (Gr. *thalamos*, a bed-chamber), layer of tissue in the apothecium, consisting of paraphyses and periphyses.
THALLINE MARGIN, an apothecial margin formed of and usually coloured like the thallus, *cf.* amphithegium.
THALLOID EXCIPLE, thalloid margin of the apothecium.
THALLUS (Gr. *thallos*, a sprout), vegetative part of the lichen-plant.
THECA (Gr. *theke*, a case), an enlarged cell containing spores, *cf.* ascus.
THECIFEROUS (Gr. *theke*, a case, Lat. *fero*, to carry), bearing the asci.
THECIUM (Gr. *theke*, a case), the layer of tissue in the apothecium consisting of asci and paraphyses, *cf.* hymenium.
THELOTREMOID, having apothecia like those of the genus *Thelotrema*.
THYRSOID (Lat. *thyrsus*, the bacchic staff, Gr. *eidos*, like), with crowded, dichotomous branching.
TOMENTOSE (Lat. *tomentum*, a stuffing for cushions), densely covered with down-like hairs.
TORULOSE (Lat. *torus*, muscle), cylindric, with swollen portions at successive intervals.
TRABECULOSE (Lat. *trabecula*, a little beam), applied to reticulating fibrils.
TRICHOTOMOUSLY (Gr. *triche*, in a three-fold manner, *tome*, a cutting), branching in a three-fold manner.
TRIVIAL (Lat. *trivialis*, common), the specific name.
TRUNCATE (Lat.), ending abruptly, as if cut off.
TUBERCLE (Lat. *tuber*, a tumor), a small excrescence or wart—**TUBERCULATE**, **TUBERCULOSE**.
TUBULIFORM (Lat. *tubulus*, a small pipe), applied to a thallus of round pipe-like filaments.
TUMID (Lat.), inflated, swollen.
TUNICATED (Lat. *tunica*, a garment), having a coat or covering.
TURBINATE (Lat. *turbo*, a whipping-top), shaped like a top.
TURGID (Lat. *turgidus*, inflated), swollen.
- UMBER, UMBRINE** (Lat.), the colour of umber, a dull-brown.
UMBILICATE (Lat. *umbilicus*, the navel), navel-like, depressed in the centre.
UMBILICATELY, applied to a thallus centrically affixed to the matrix.
UMBO, UMBONATE (Lat. *umbo*, any convex elevation), bearing an umbo in the centre.
UNDULATE (Lat. *unda*, a wave), with a wavy margin.
UNISERIATE (Lat. *unus*, one, *series*, a succession), in one row.
URCEOLATE (Lat. *urceus*, a pitcher), pitcher-like, hollow and contracted at the mouth.
- VARIOLARIOID** (Lat. *variola*, the pustule of small-pox), with powdery or granular tubercles like the supposed fructification of the old genus *Variolaria*—**VARIOLOSE**.
VENTRICOSE (Lat. *venter*, the belly), swollen or inflated.
VERMICULAR (Lat. *vermiculus*, a little worm), worm-shaped.
VERRUCA (Lat., a wart), the granular wart-like part of the thallus.
VERRUCARIOID, fructification similar to that of the genus *Ferrucaria*.
VERSICOLOROUS (Lat. *verso*, to turn often, *color*, colour), changing colour.
VERTICIL (Lat. *vertex*, a whirl), a whorl, circular arrangement of parts round an axil—**VERTICILLATE**.
VESICULOSE (Lat. *vesicula*, a bladder), as if composed of small bladders.
VILLOSE (Lat. *villus*, a shaggy hair), bearing long hairs.
VITELLINE (Lat. *vitellus*, the yolk of an egg), egg-yellow.
- ZEORINE**, as in *Zeora*, in which the apothecium had a double margin.

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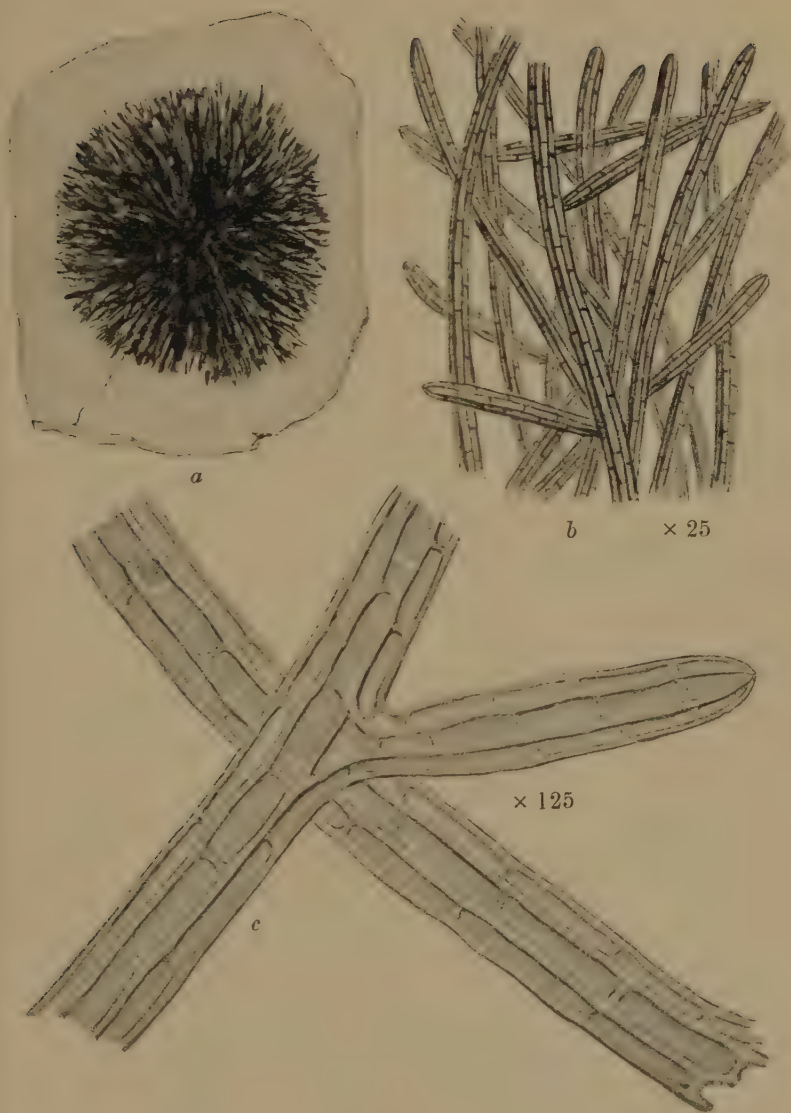
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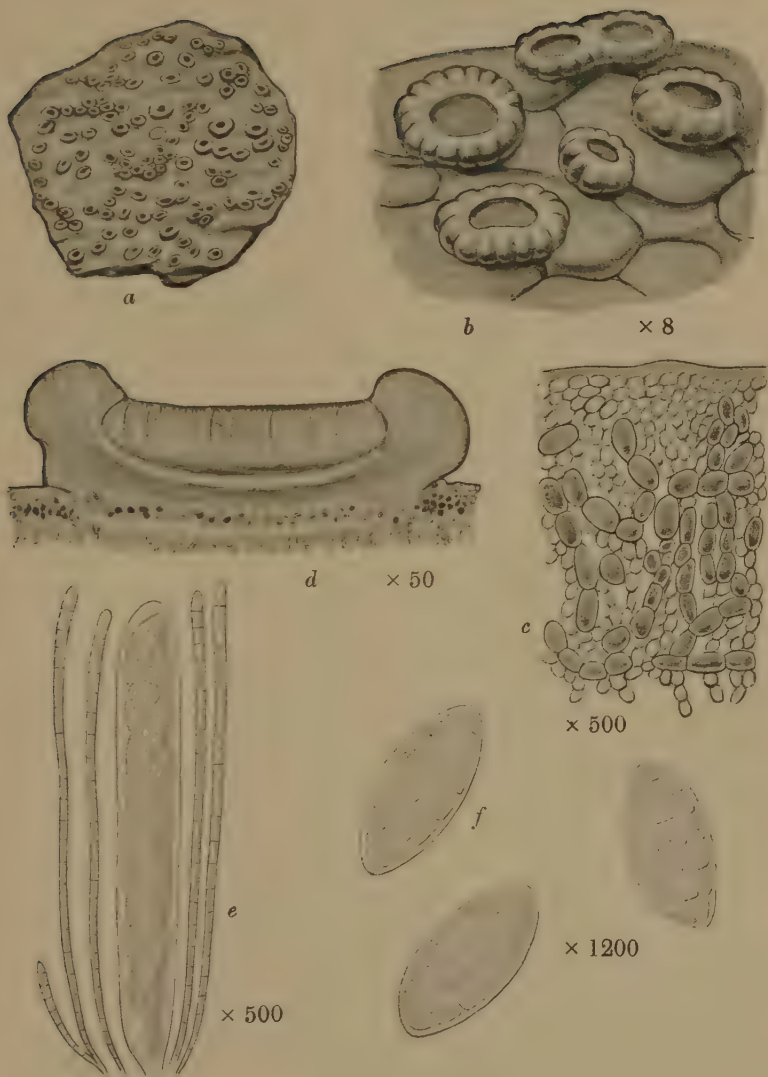
CÆNOGONIUM EBENEUM A. L. Sm.

a. Plant on stone. b. Portion of thallus. c. Filaments of thallus.



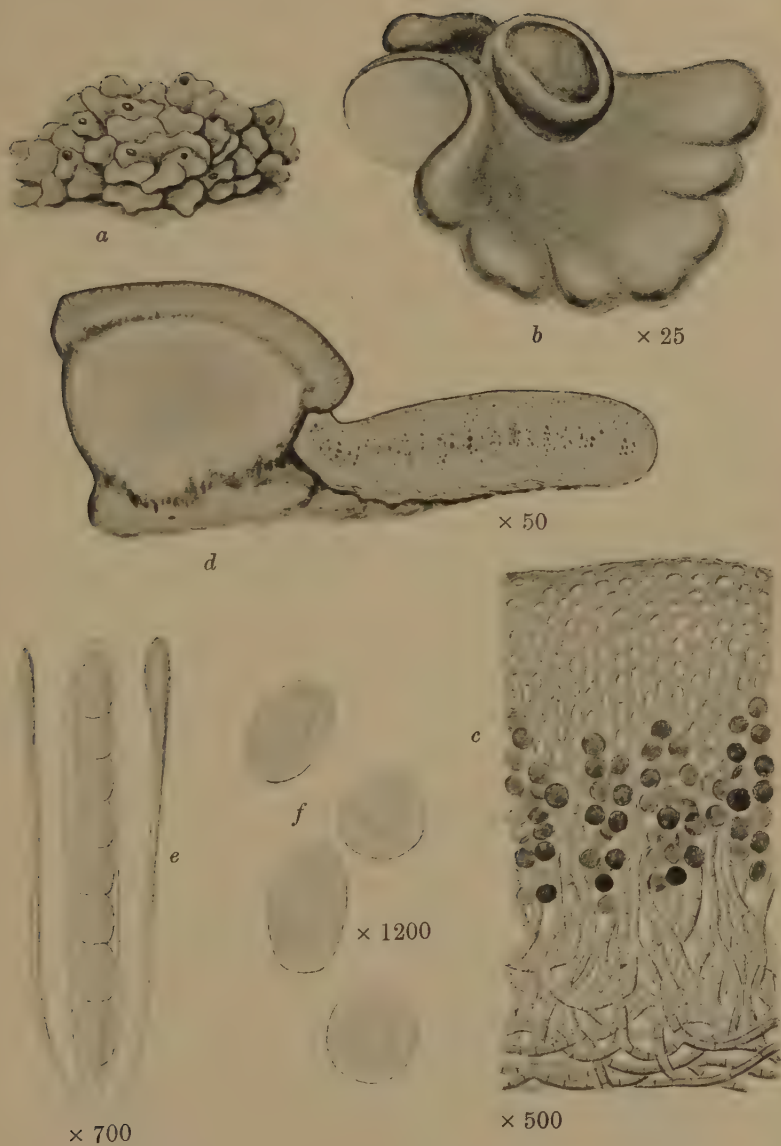
RACODIUM RUPESTRE Pers.

a. Plant on rock. *b.* Portion of thallus. *c.* Filaments of thallus.



GYALECTA CUPULARIS Schær.

- a.* Plant on rock. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecium. *e.* Ascus and paraphyses. *f.* Spores.



LECIDEA (PSORA) LURIDA Ach.

- a.* Plant. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecium. *e.* Ascus and paraphyses. *f.* Spores.



a



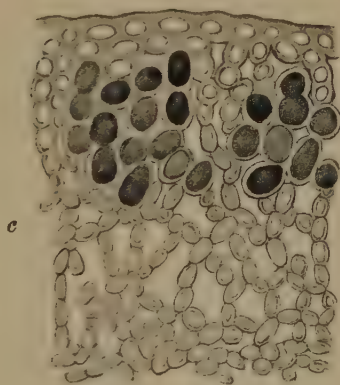
b

× 25



d

× 60



c

× 500



e

× 500

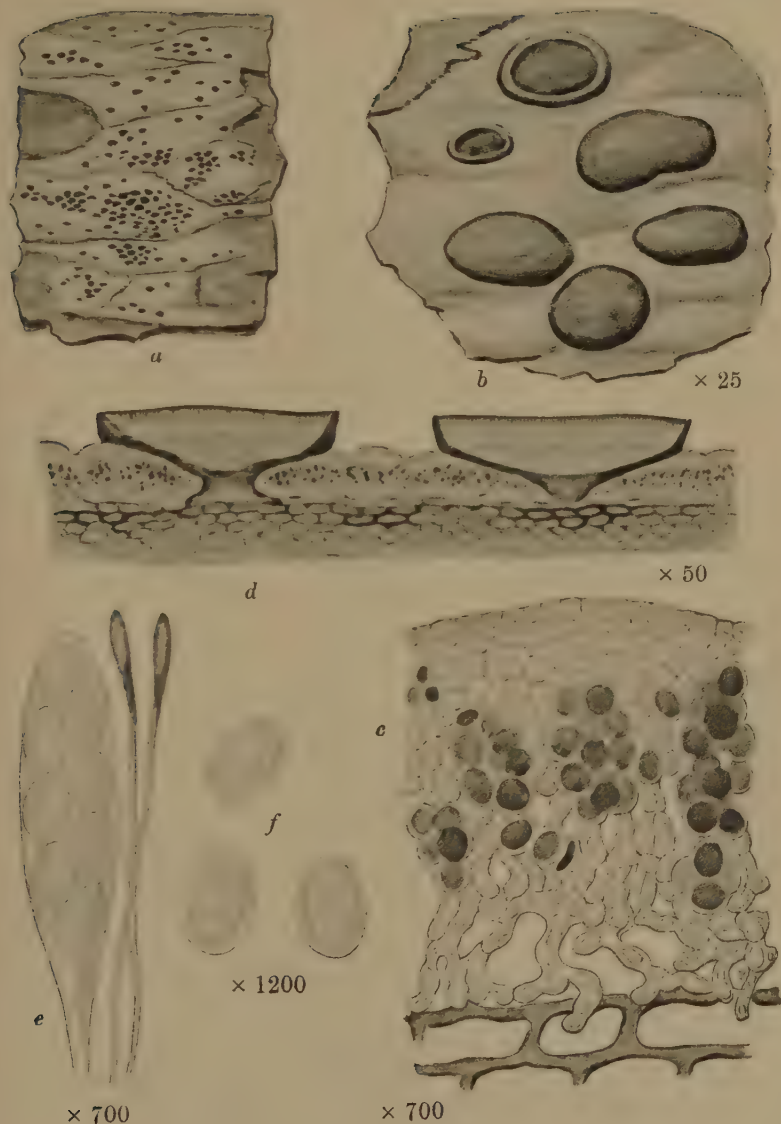


f

× 1000

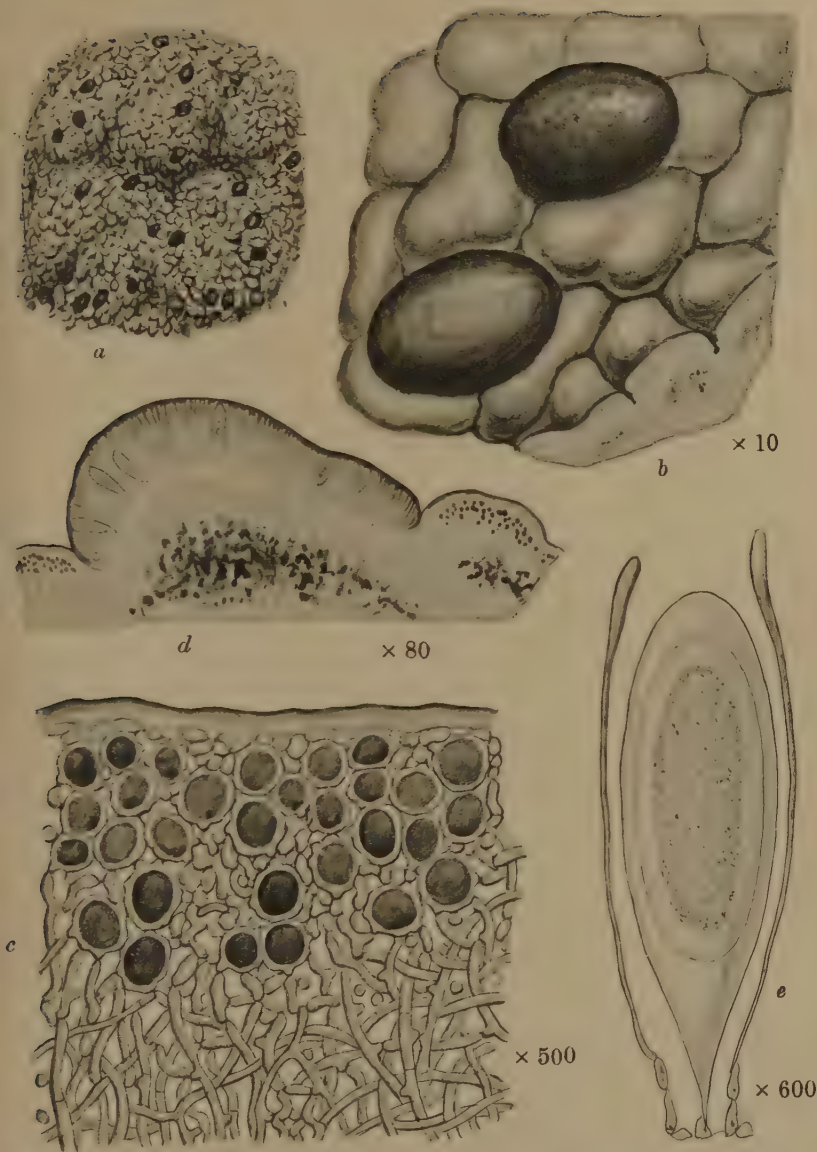
LECIDEA (BIATORA) VERNALIS Ach.

- a. Plant on moss. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecium. e. Ascus and paraphyses. f. Spores.



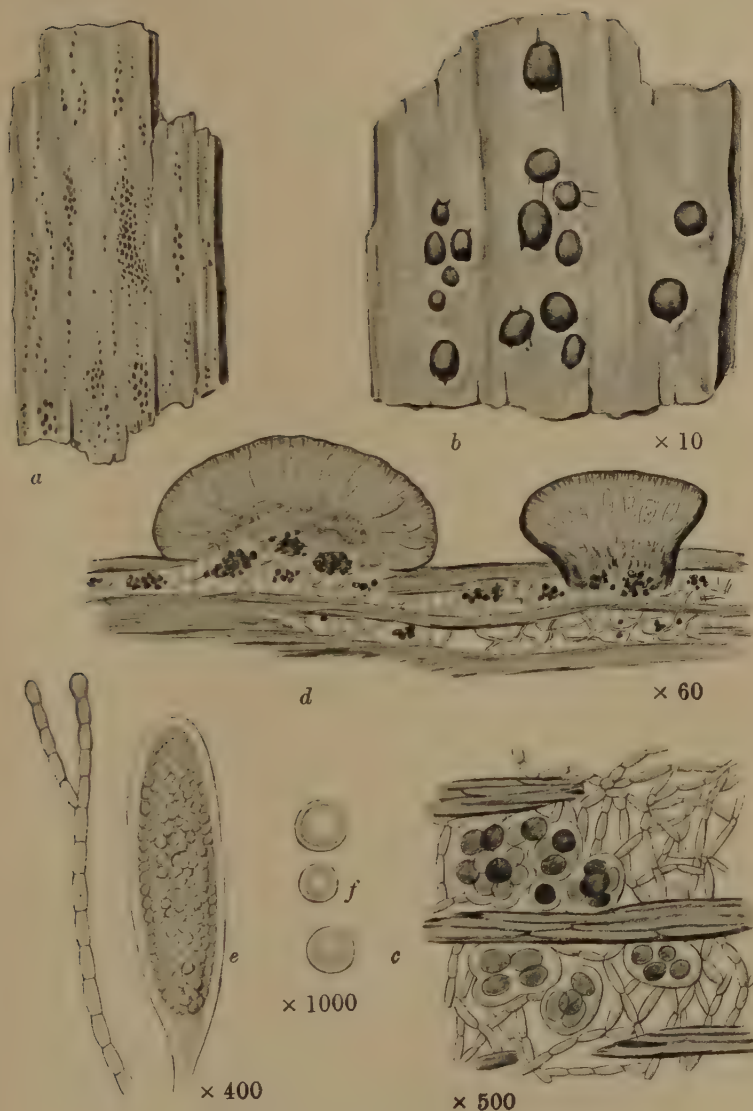
LECIDEA (EULECIDEA) PARASEMA Ach.

- a. Plant on bark. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecia. e. Ascus and paraphyses. f. Spores.



LECIDEA (MYCOBLASTUS) SANGUINARIA Ach.

- a. Plant. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecium. e. Ascus with spore and paraphyses.



BIATORELLA MORIFORMIS Th. Fries

- a. Plant on wood. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecia. e. Ascus and paraphysis. f. Spores.

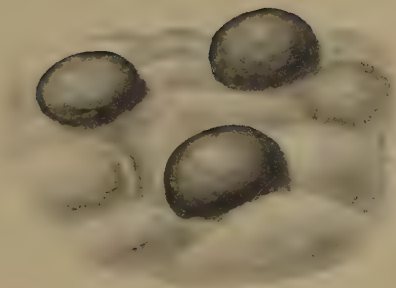


BIATORINA PULVEREA Mudd

- a. Plant on bark. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecium. e. Ascus and paraphysis. f. Spores.

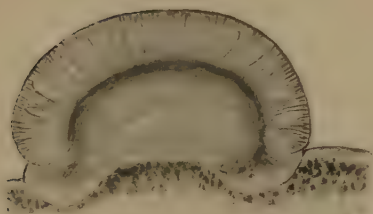


a



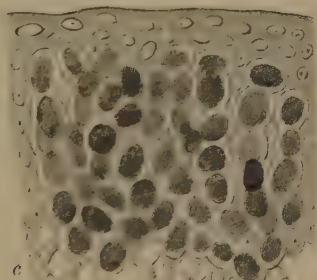
b

$\times 25$



d

$\times 60$



c

$\times 600$



e

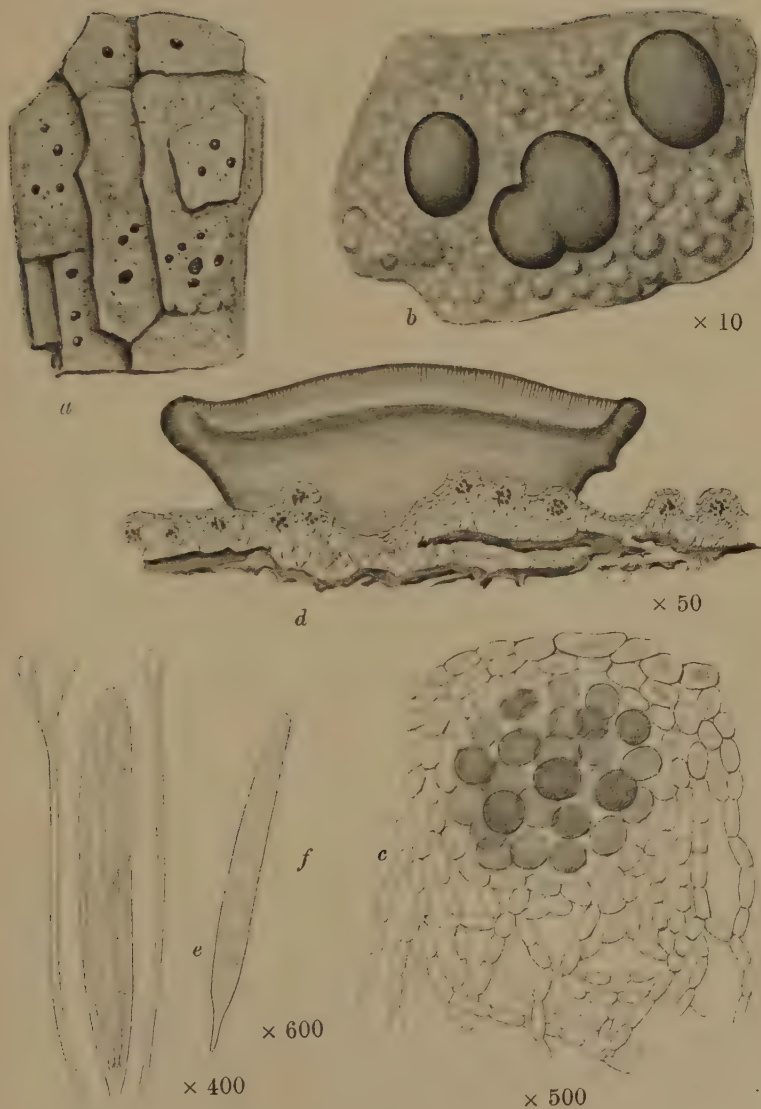
$\times 600$

$\times 1000$

f

BILIMBIA SABULETORUM Branth & Rostr.

- a*. Plant on moss. *b*. Portion of thallus and apothecia *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphyses. *f*. Spores.



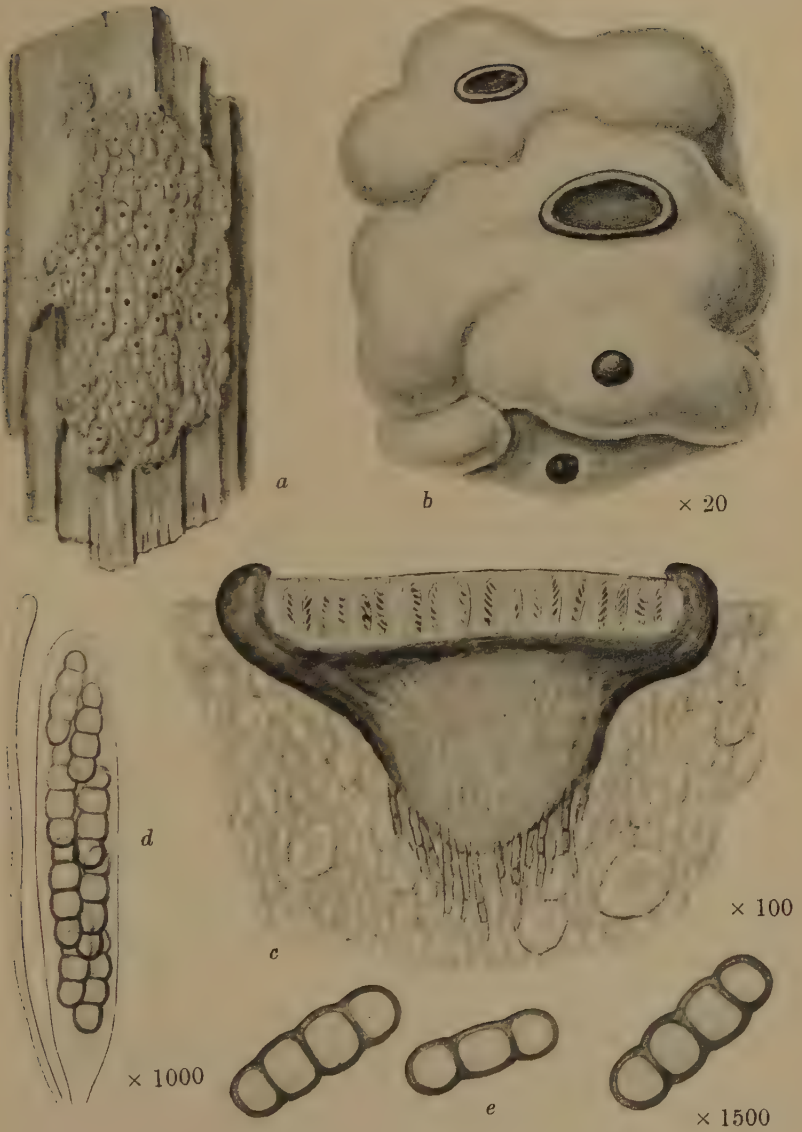
BACIDIA LUTEOLA Mudd

- a. Plant on bark. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecium. e. Ascus and paraphyses. f. Spore.



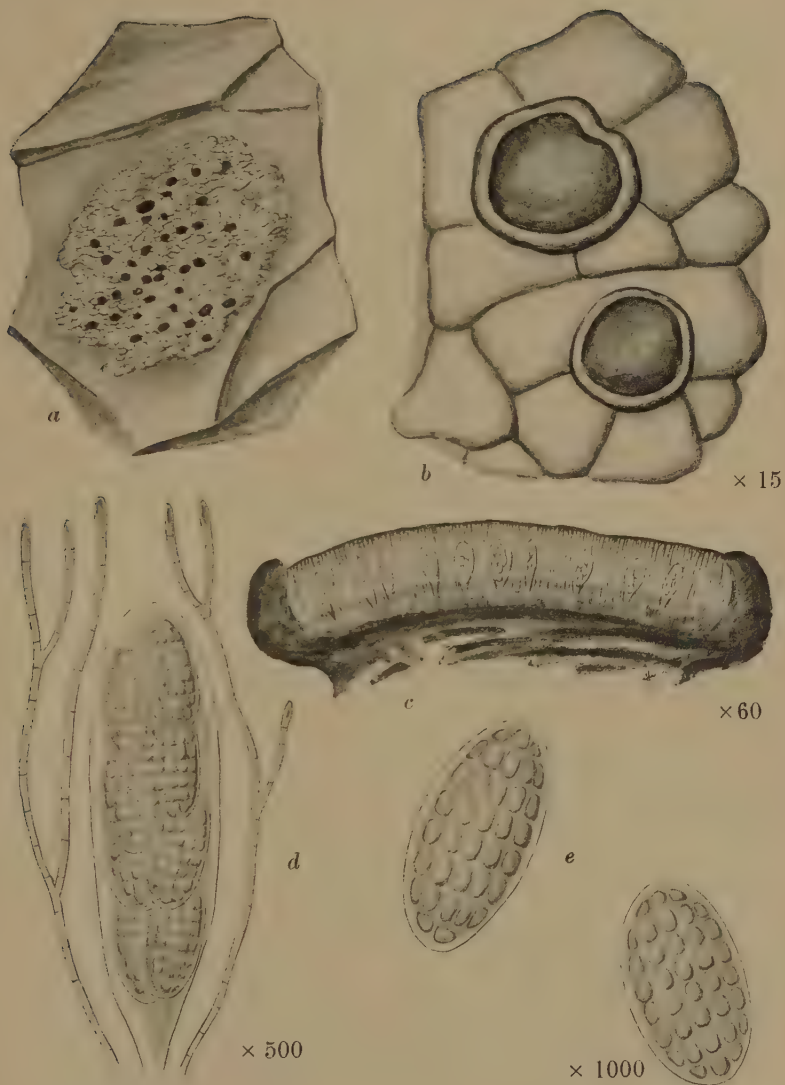
BUELLIA MYRIOCARPA Mudd

- a.* Plant on wood. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecium. *e.* Ascus and paraphysis. *f.* Spores.



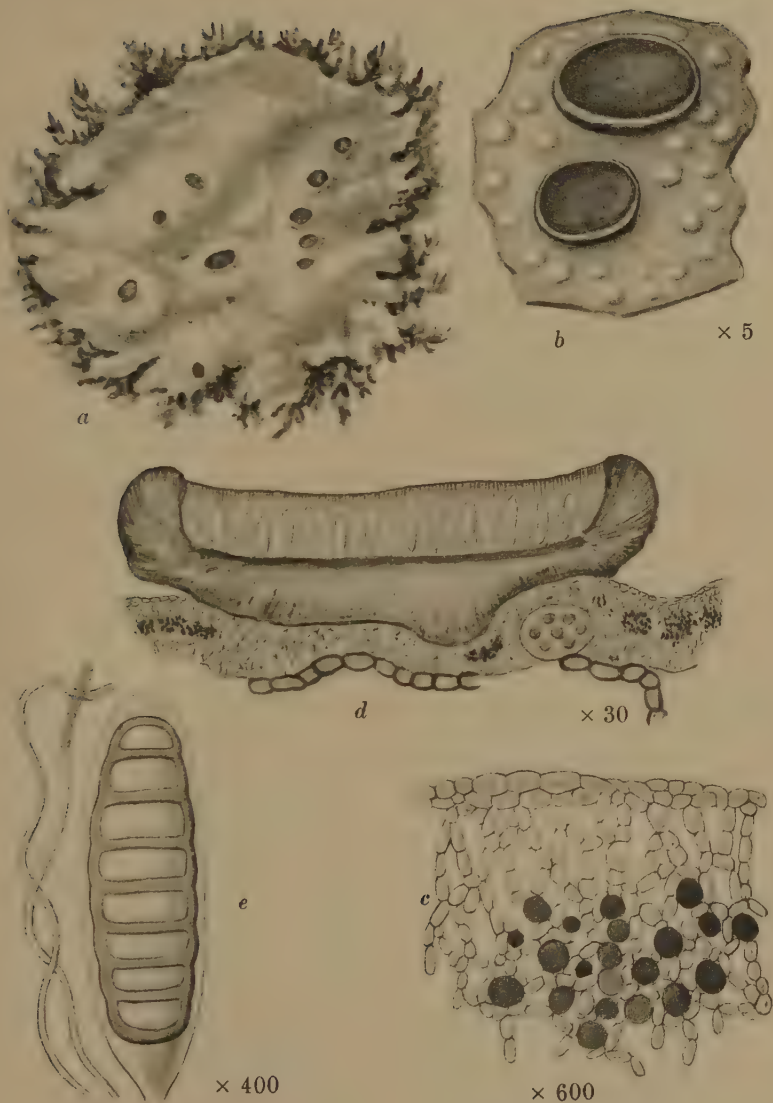
LECIOGRAPHA PARASITICA Massal.

a. Plant on lichen. *b.* Portion of host and apothecia. *c.* Vertical section of apothecium. *d.* Ascus and paraphysis. *e.* Spores.



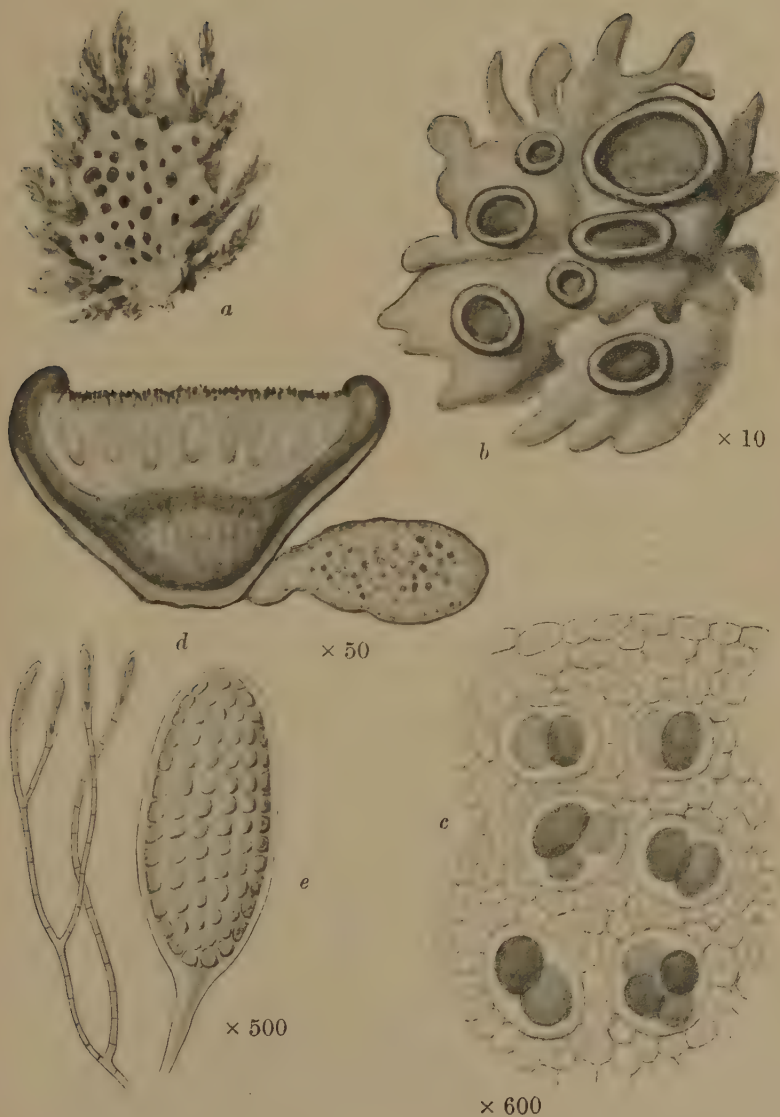
RHIZOCARPON OBSCURATUM Massal.

a. Plant on rock. *b.* Portion of thallus and apothecia. *c.* Vertical section of apothecium. *d.* Ascus and paraphyses. *e.* Spores.



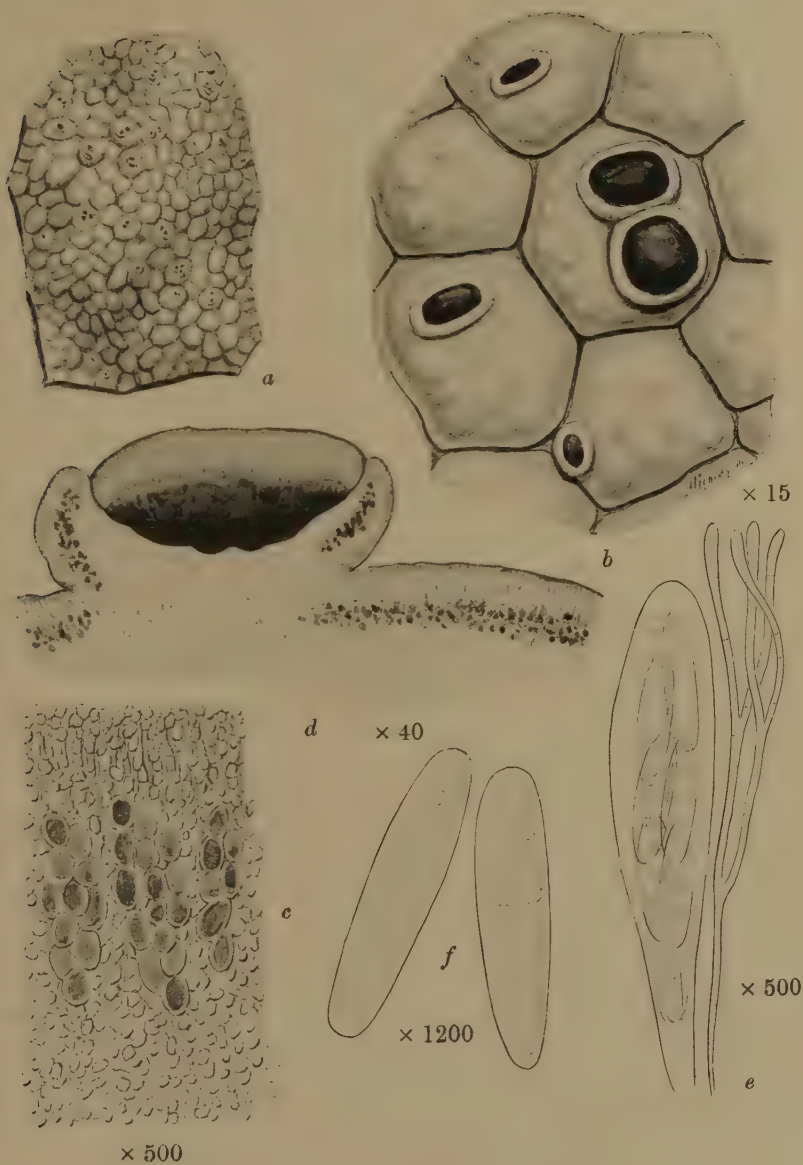
BOMBYLIOSPORA PACHYCARPA Massal.

a. Plant on moss. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecium. *e.* Ascus with spore and paraphyses.



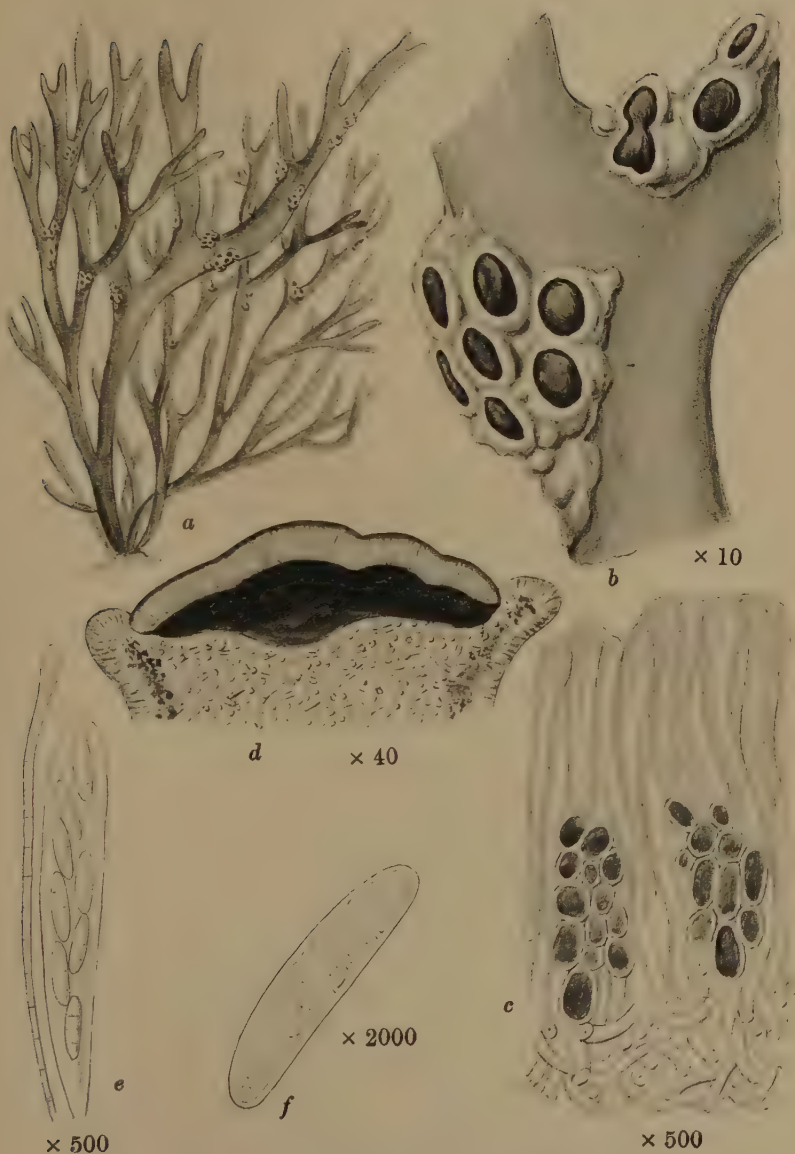
LOPADIUM PEZIZOIDEUM Koerb.

a. Plant on moss. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecium. e. Ascus with spore and branched paraphysis.



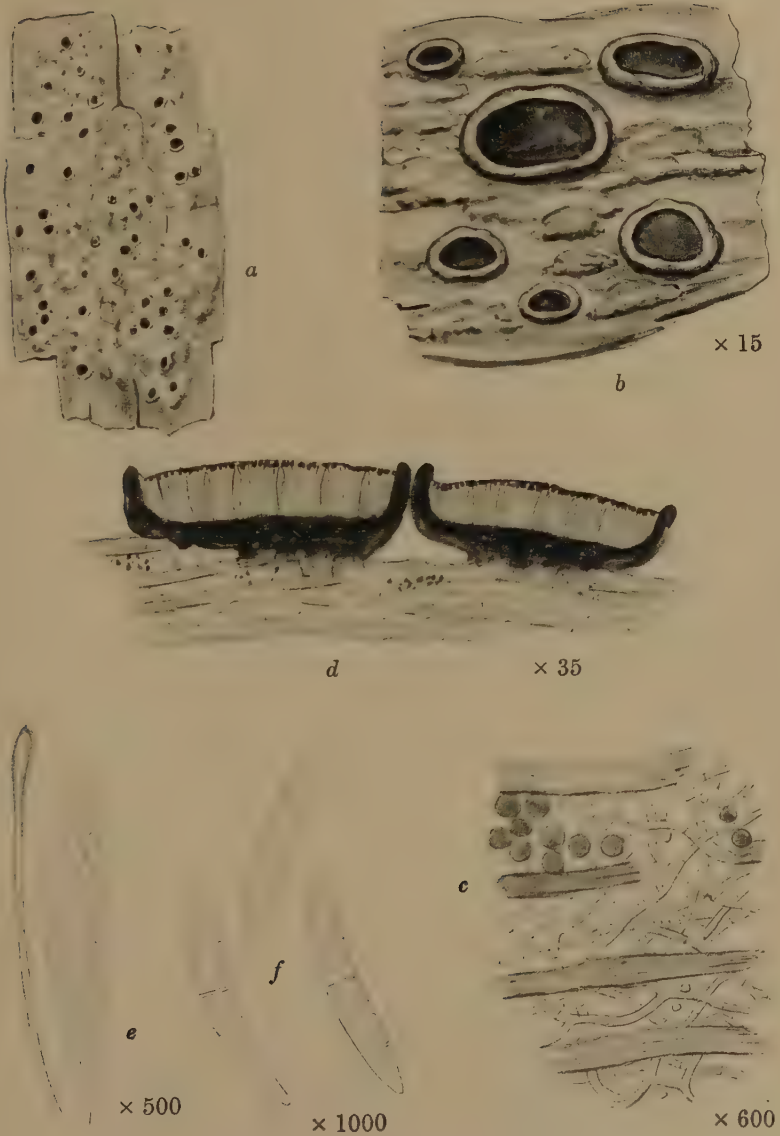
DIRINA REPANDA Nyl.

- a. Plant on rock. b. Portion of plant. c. Vertical section of thallus. d. Vertical section of thallus and apothecium. e. Ascus and paraphysis. f. Spores.



ROCCELLA FUCIFORMIS DC.

- a.* Plant from rock. *b.* Portion of plant with apothecia. *c.* Transverse section of frond. *d.* Vertical section of apothecium. *e.* Ascus and paraphysis. *f.* Spore.



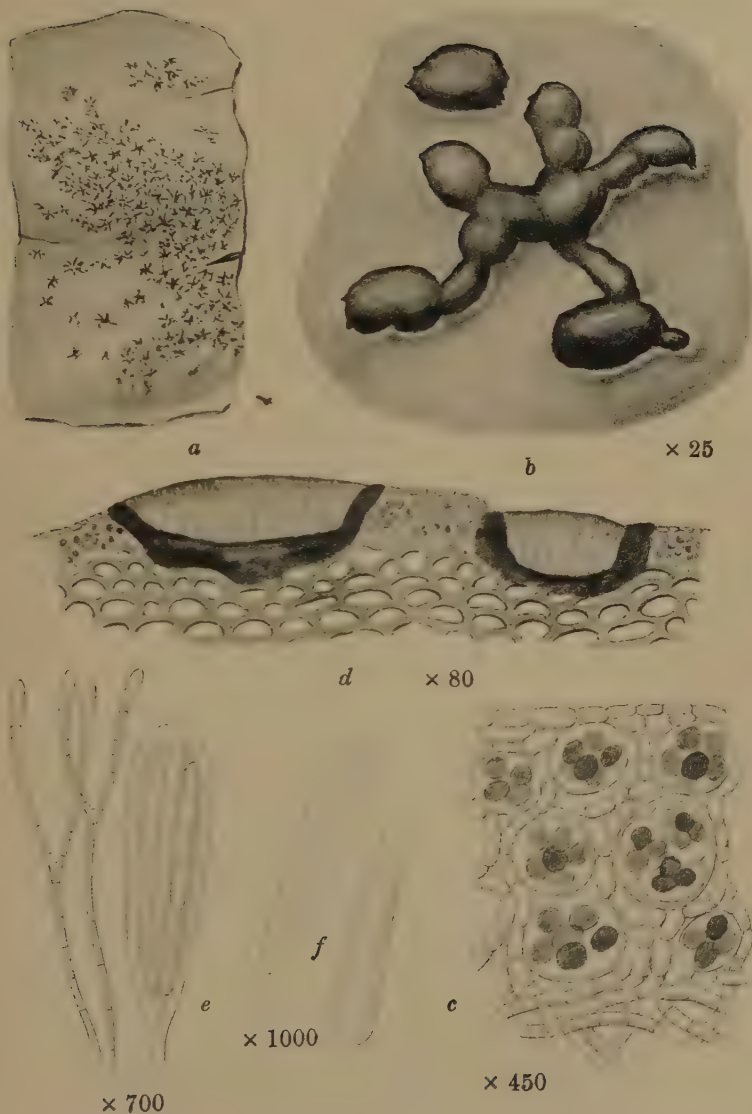
LECANACTIS PREMNEA Wedd.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphysis. *f.* Spores.



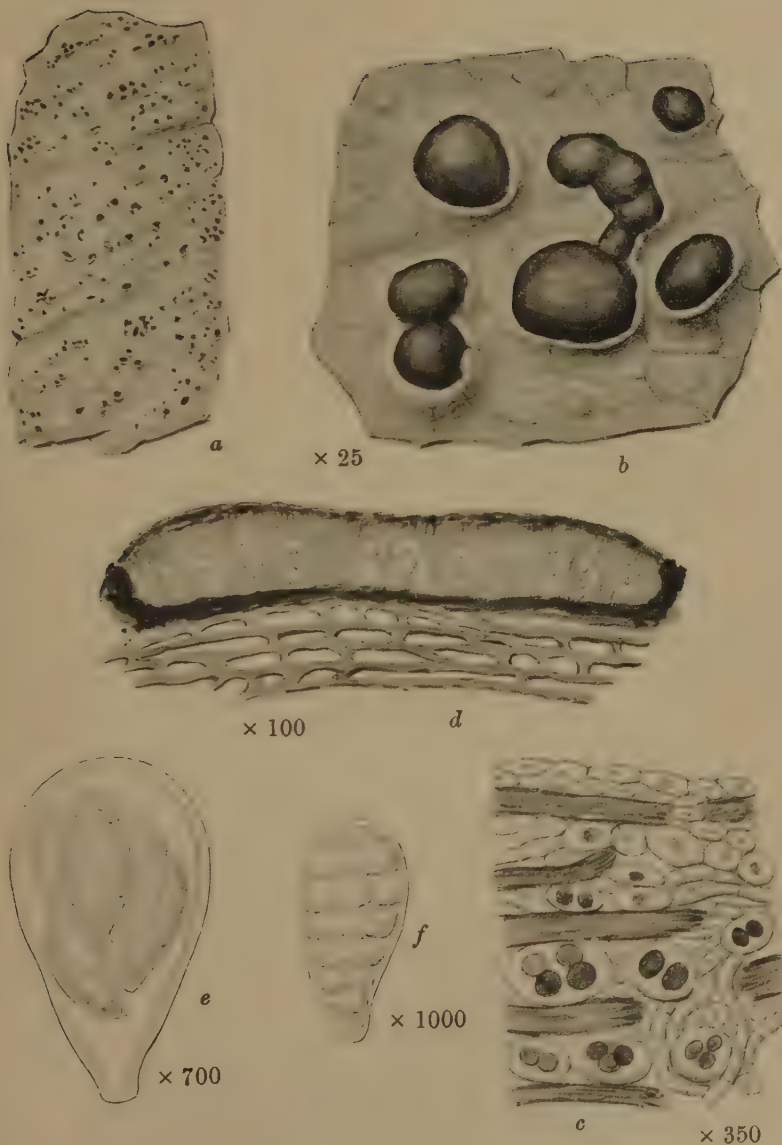
PLATYGRAPHA PERICLEA Nyl.

- a. Plant on bark. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecium. e. Ascus and paraphysis. f. Spore.



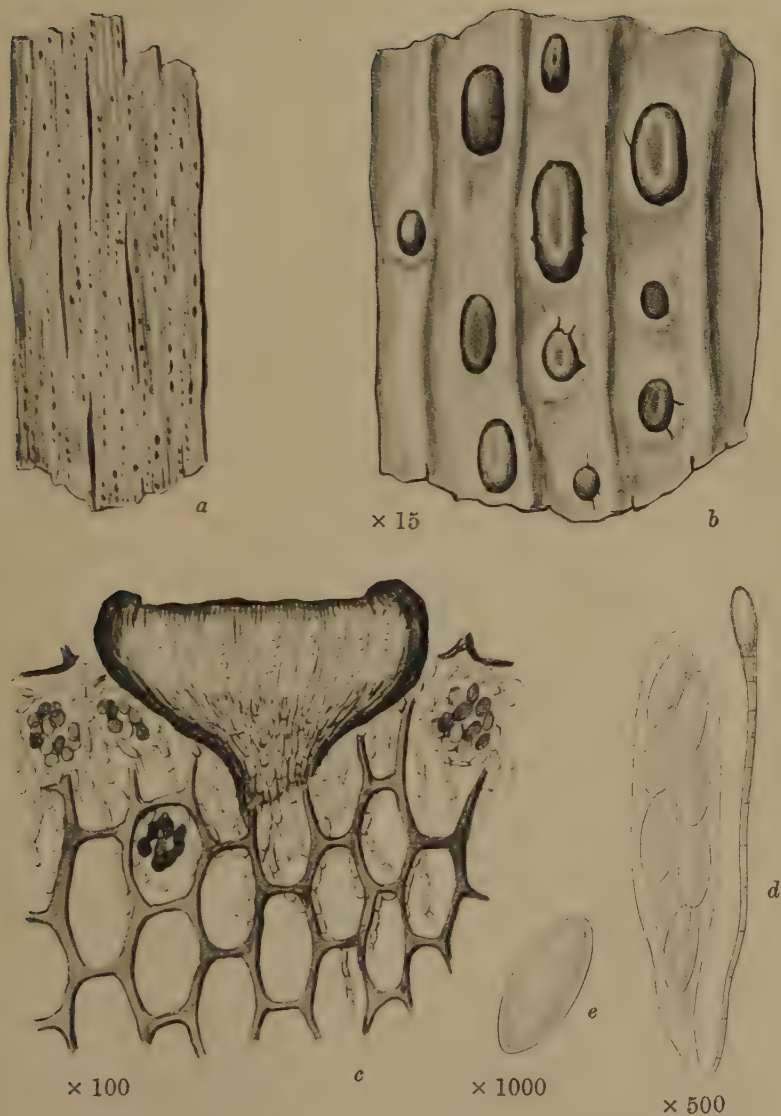
ARTHONIA RADIATA Ach.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphyses. *f.* Spores.



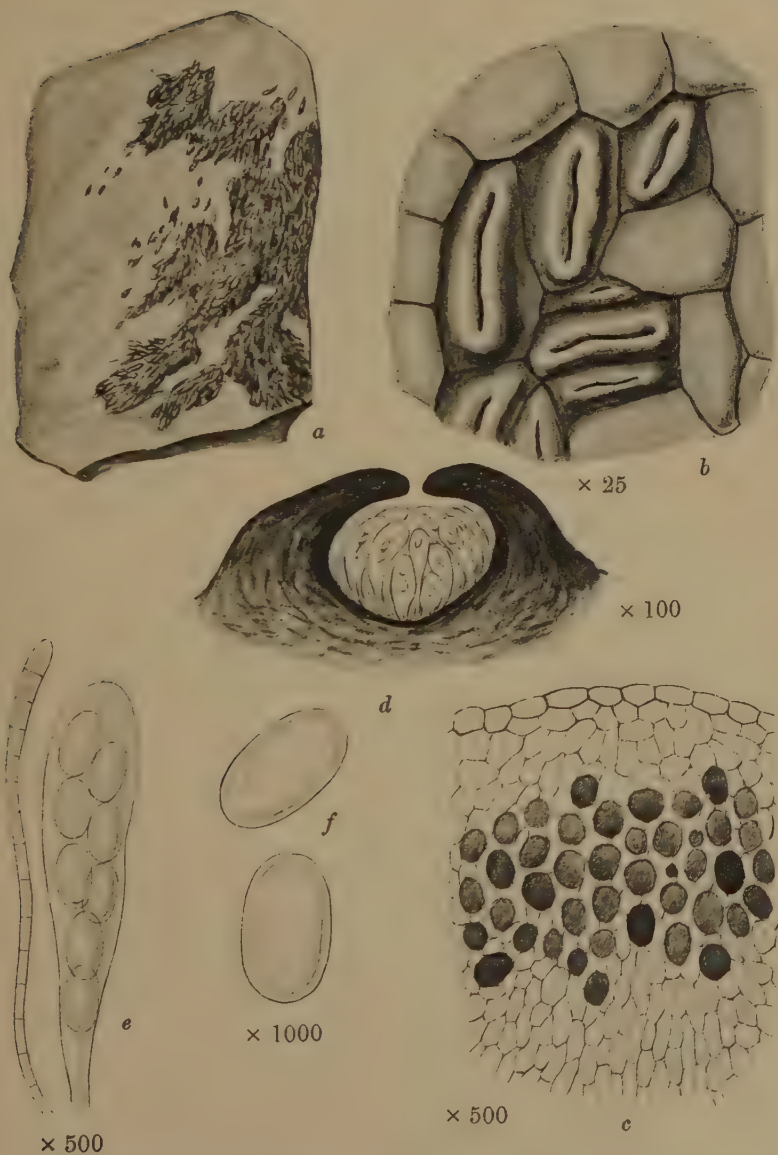
ARTHOTHELIUM SPECTABILE Massal.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecium. *e.* Ascus. *f.* Spore.



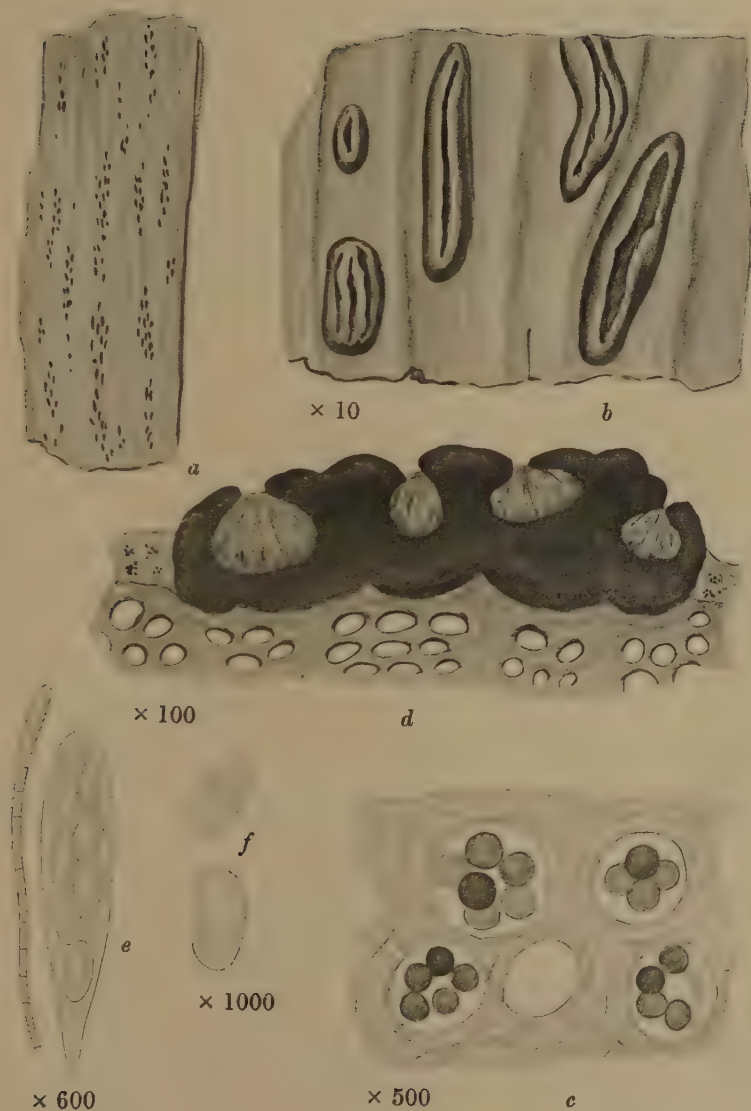
XYLOGRAPHA PARALLELA Nyl.

a. Plant on wood. b. Protruding apothecia. c. Vertical section of thallus and apothecium. d. Ascus and paraphysis. e. Spore.



LITHOGRAPHA TESSERATA Nyl.

- a. Plant on rock. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecium. e. Ascus and paraphysis. f. Spores.



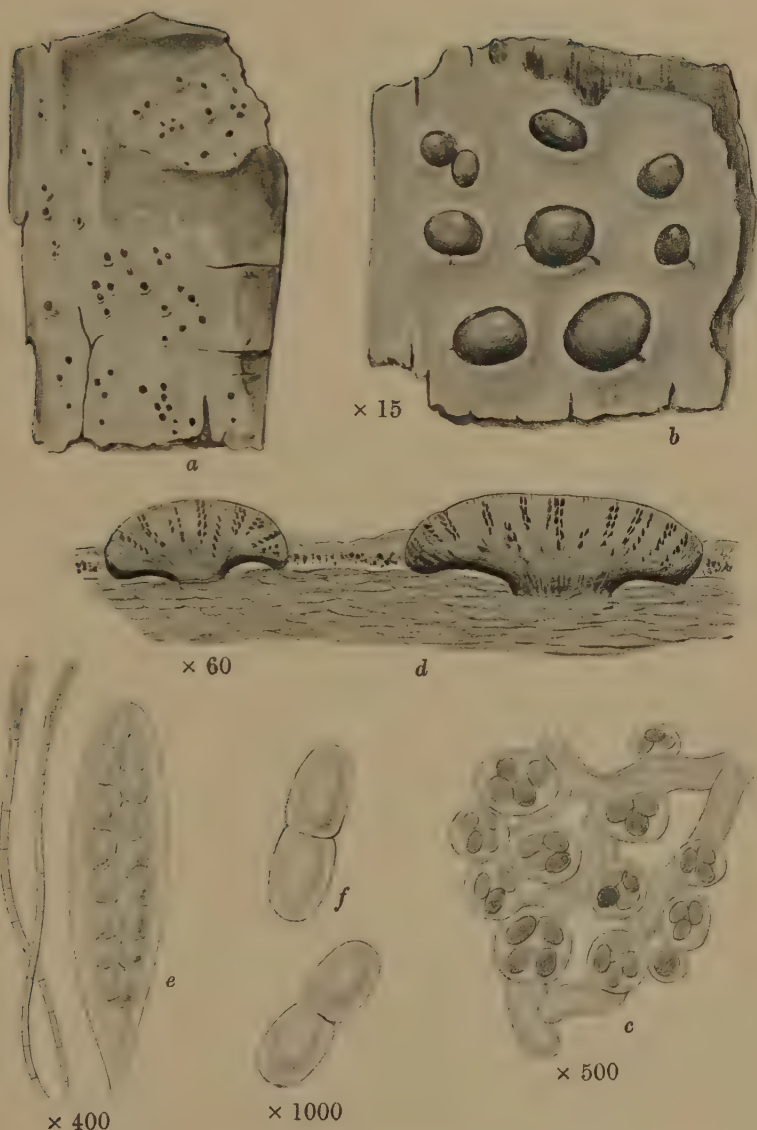
PTYCHOGRAPHA XYLOGRAPHOIDES Nyl.

- a.* Plant on wood. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphysis. *f.* Spores.



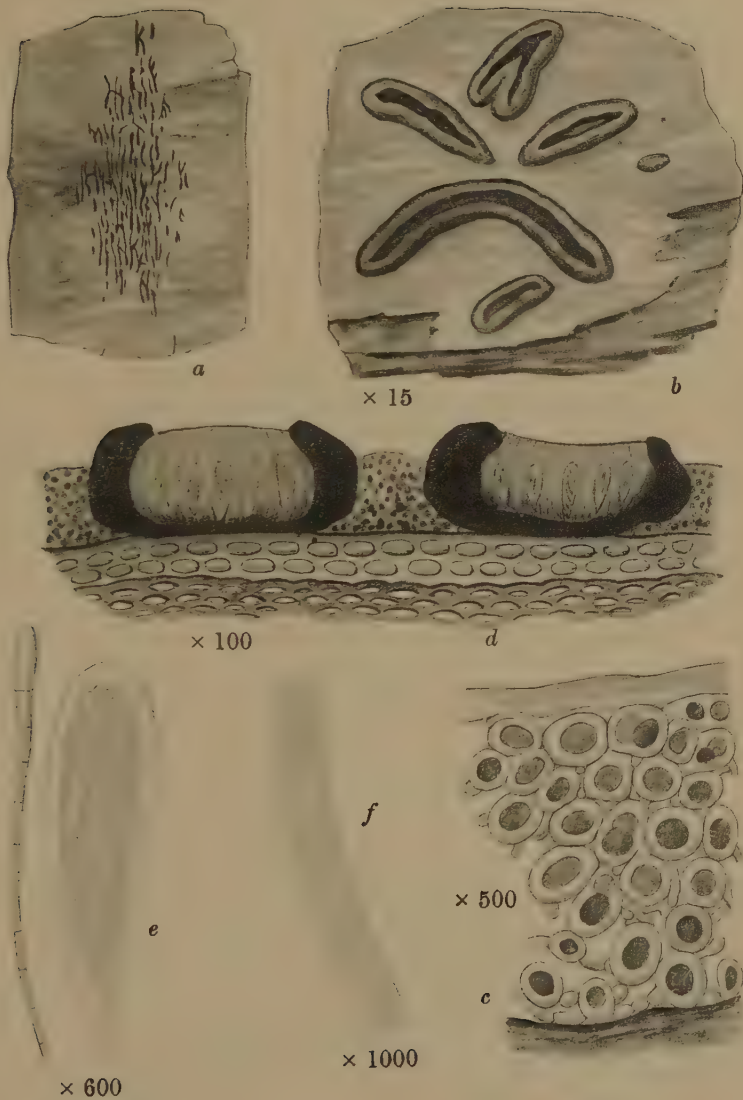
ENCEPHALOGRAPHA CEREBRINA Koerb.

- a.* Plant on rock. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphysis. *f.* Spores.



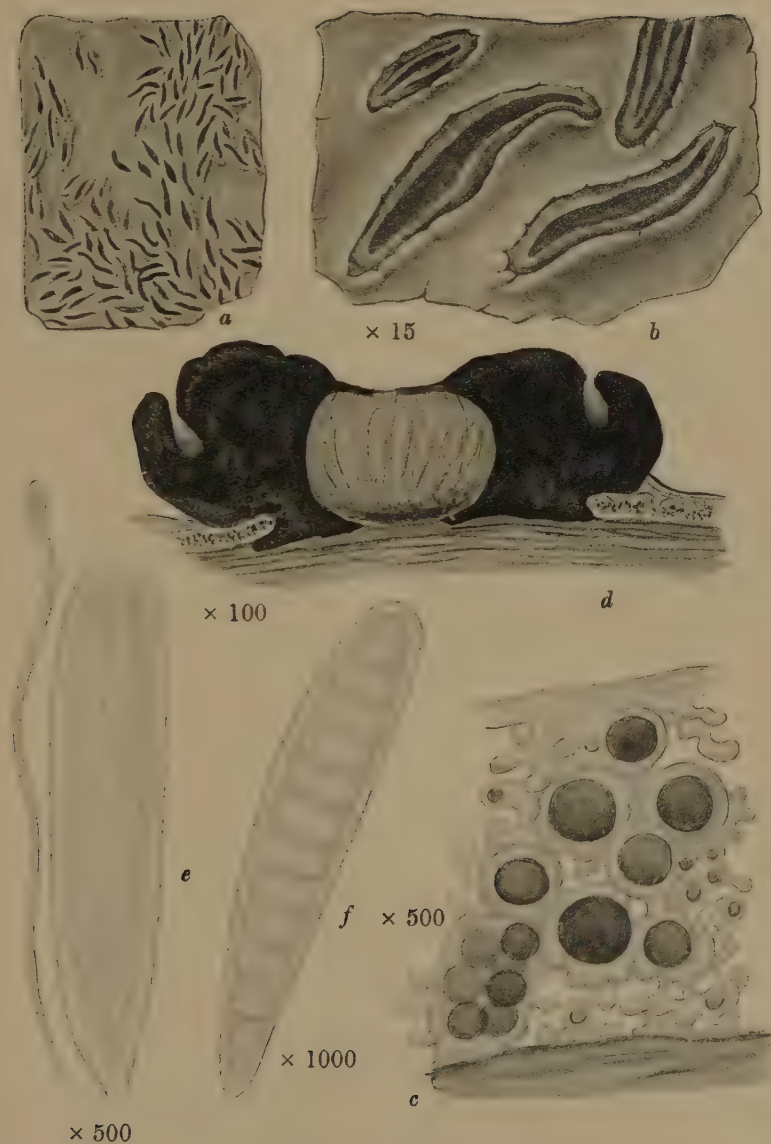
MELASPILEA PROXIMELLA Nyl.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphyses. *f.* Spores.



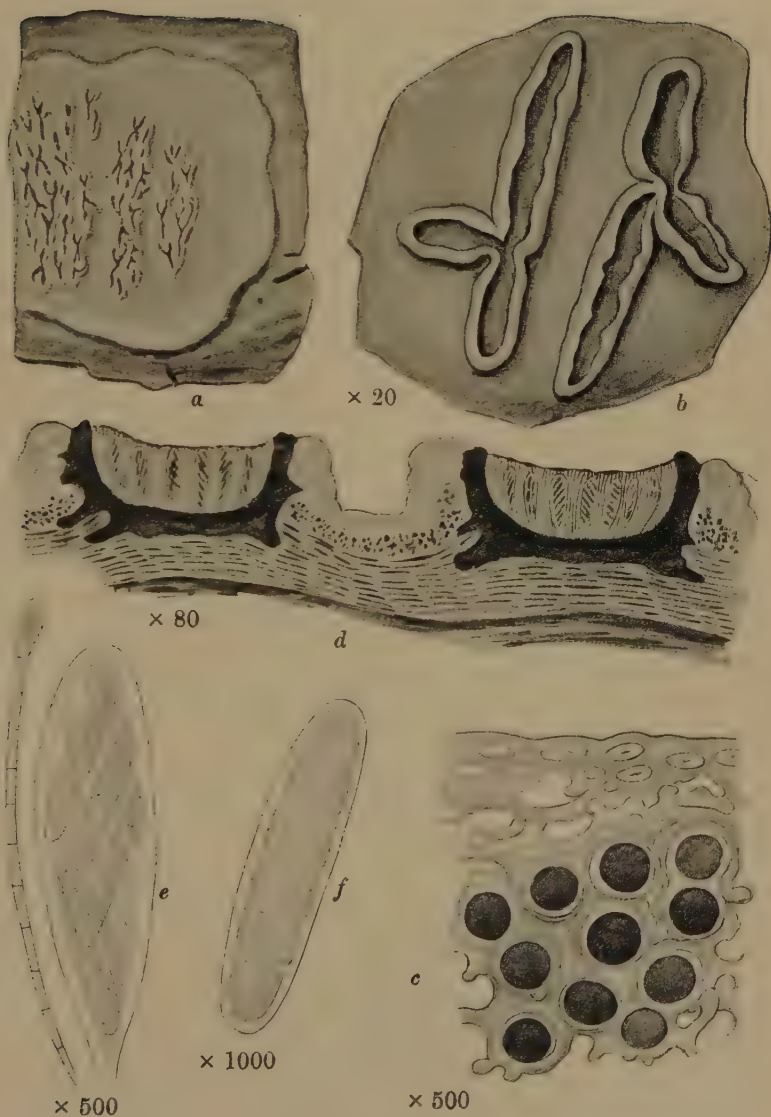
OPEGRAPHA ATRA Pers.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphysis. *f.* Spore.



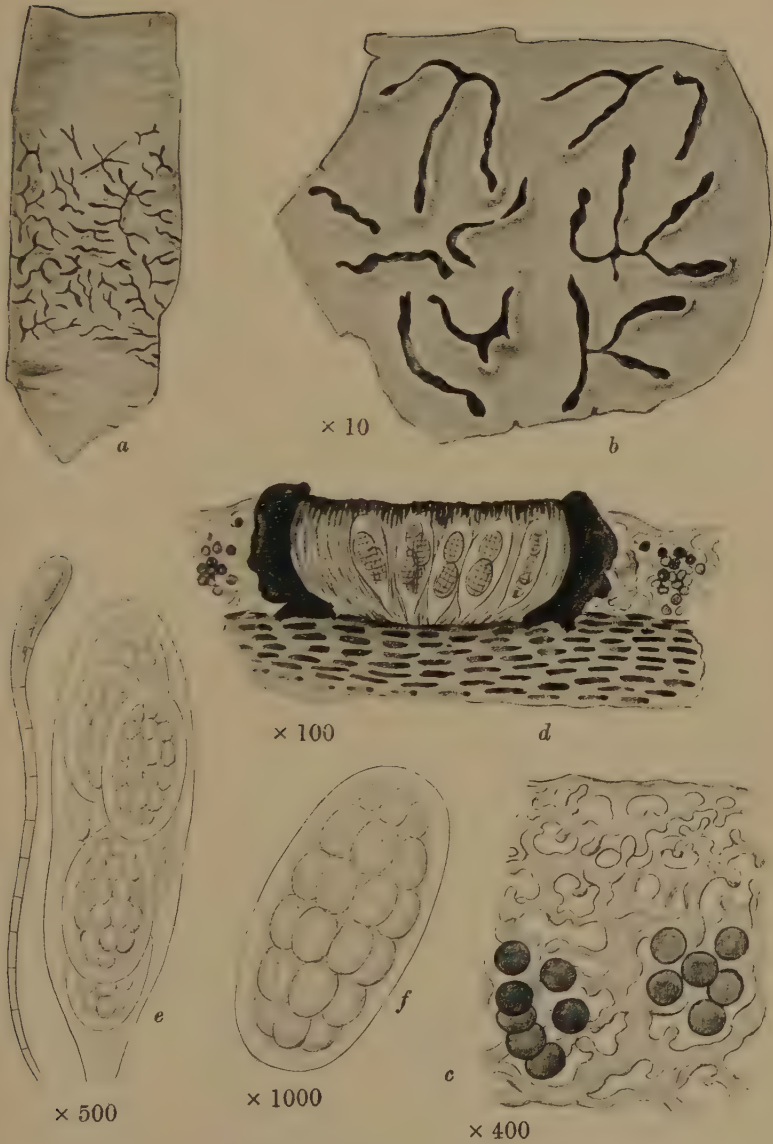
GRAPHIS ELEGANS Ach.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecium. *e.* Ascus and paraphysis. *f.* Spore.



PHÆOGRAPHIS LYELLII A. Zahlbr.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphysis. *f.* Spore.



GRAPHINA ANGUINA Muell. Arg.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecium. *e.* Ascus and paraphysis. *f.* Spore.



ENTEROGRAPHA CRASSA Fée

a. Plant on bark. b. Portion of thallus and apothecia. c. Vertical section of thallus. d. Vertical section of apothecia and spermogone. e. Ascus and paraphysis. f. Spore. g. Sterigma and spermatia.



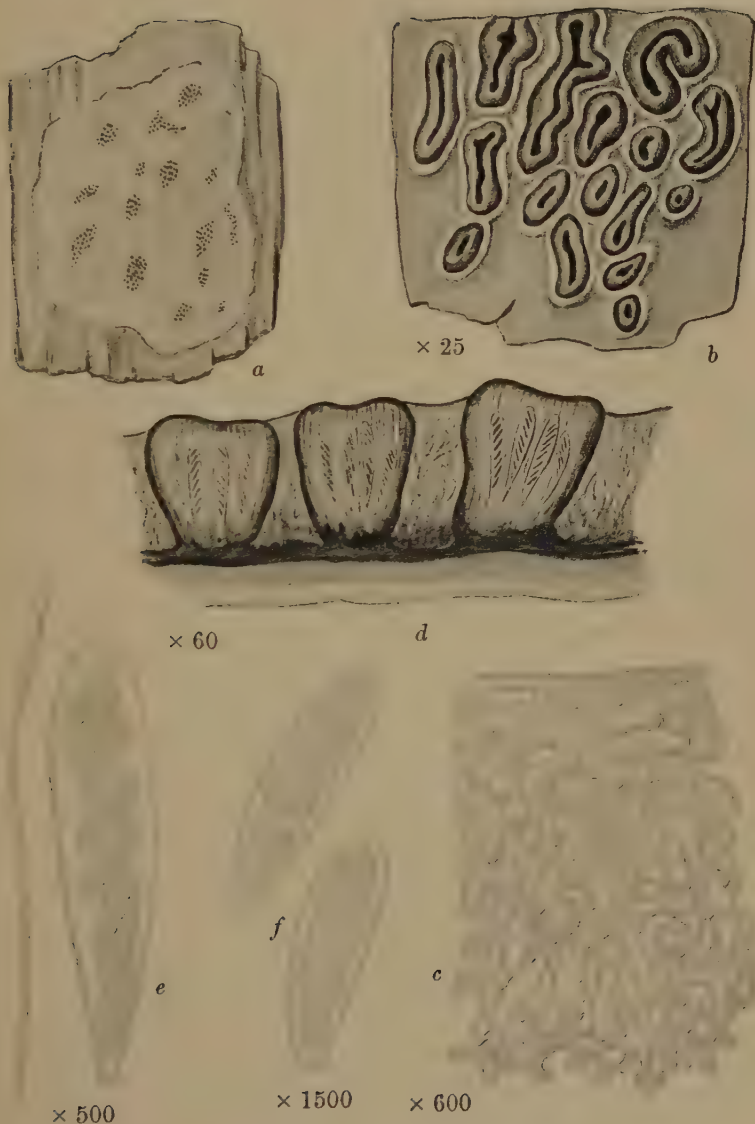
SCLEROPHYTON CIRCUMSCRIPTUM A. Zahlbr.

a. Whole plant. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus. *f.* Spores.



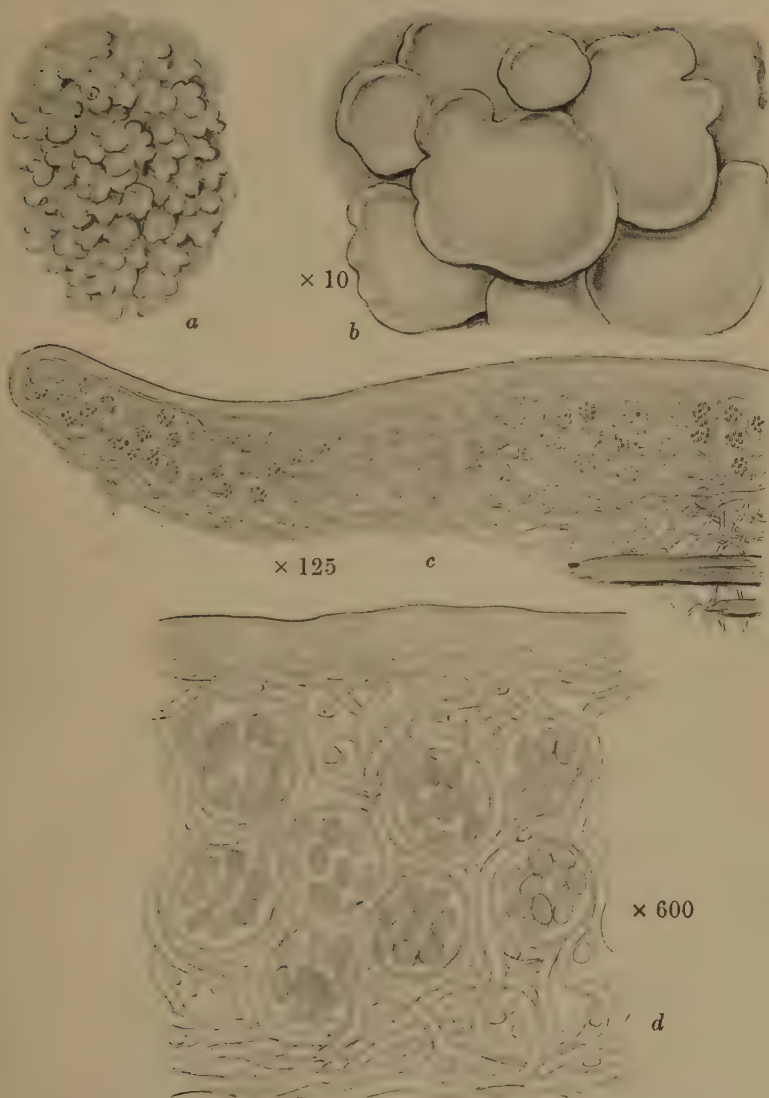
CHIODECTON ALBIDUM Leight.

- a.* Plant on rock. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphyses. *f.* Spores.



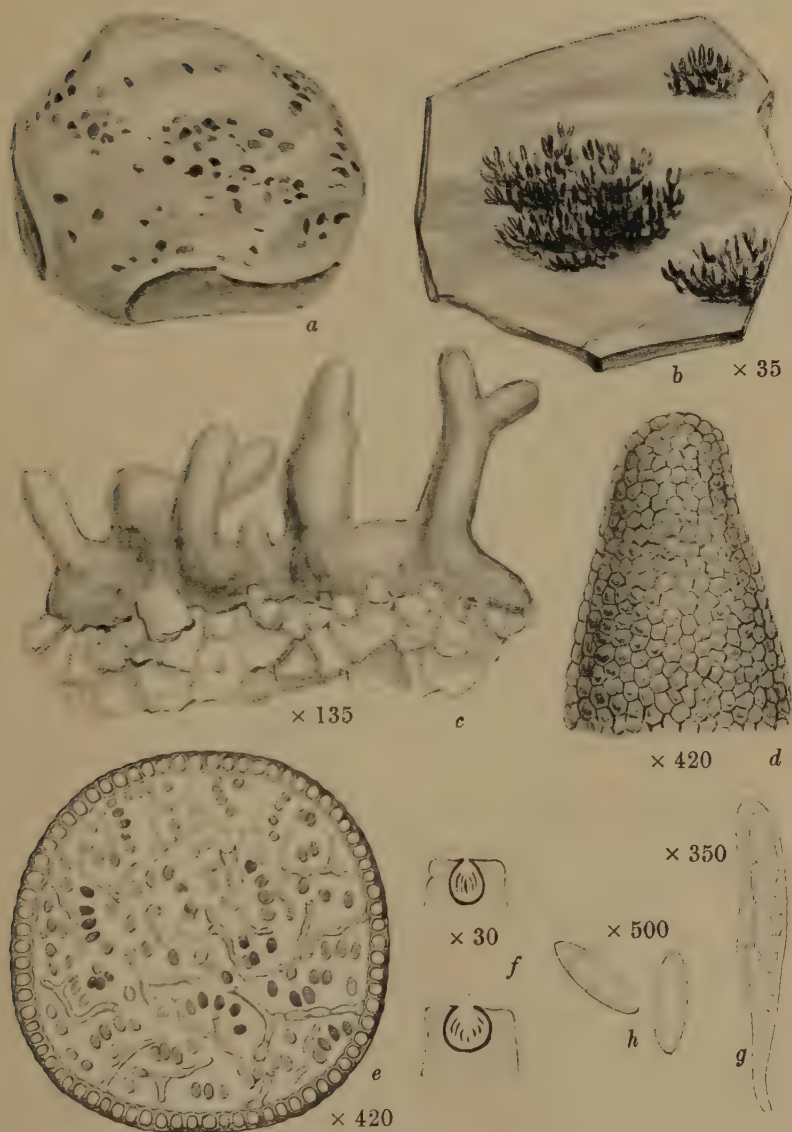
GLYPHIS LABYRINTHICA Ach.

- a.* Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus with paraphysis. *f.* Spores.



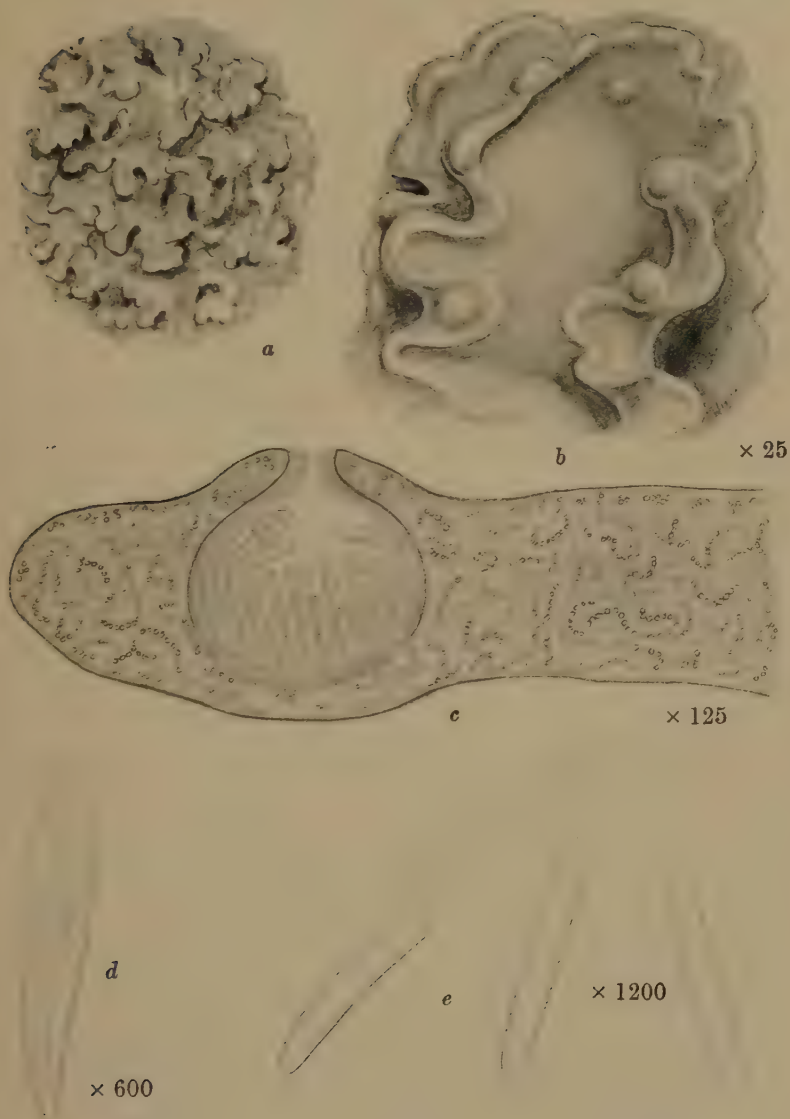
CORISCIMUM VIRIDE Wainio

- a.* Whole plant. *b.* Portion of thallus. *c.* Vertical section of thallus.
d. Vertical section of thallus.



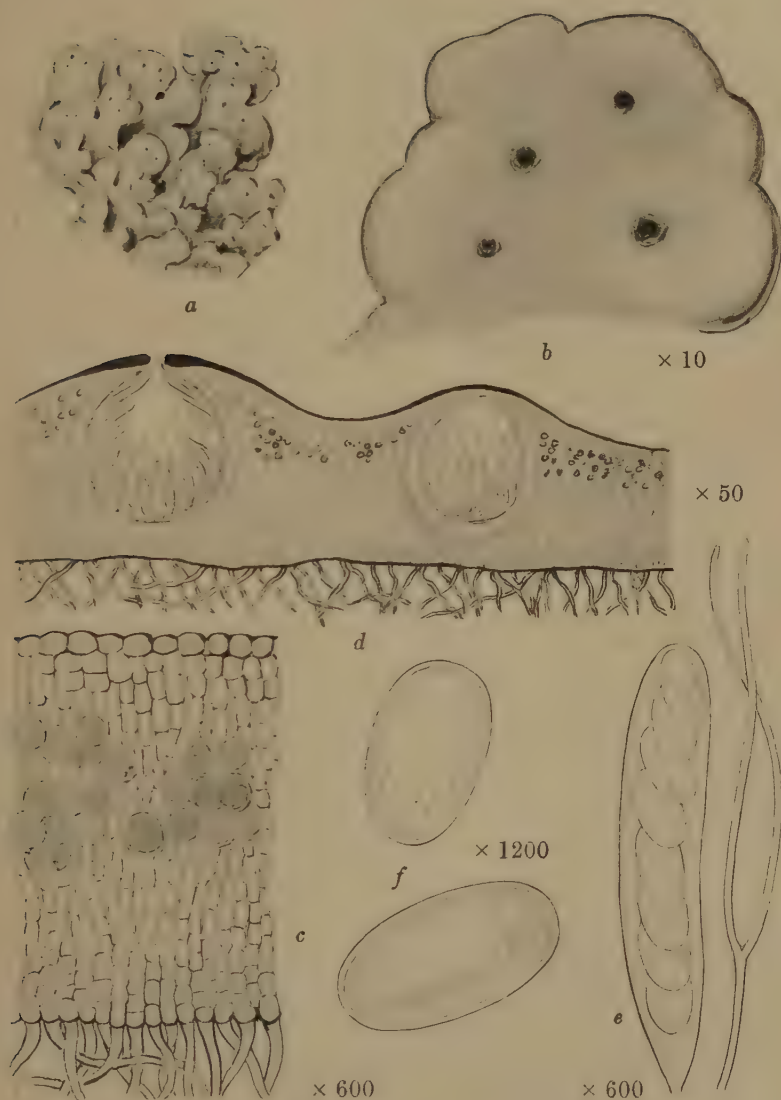
PYRENIDIUM ACTINELLUM Nyl.

- a.* Plants on rock. *b.* Plant group. *c.* Portion of plant. *d.* Surface of frond.
e. Transverse section of frond. *f.* Vertical section of perithecia.
g. Ascus. *h.* Spores. (*f. g. h.* after Crombie.)



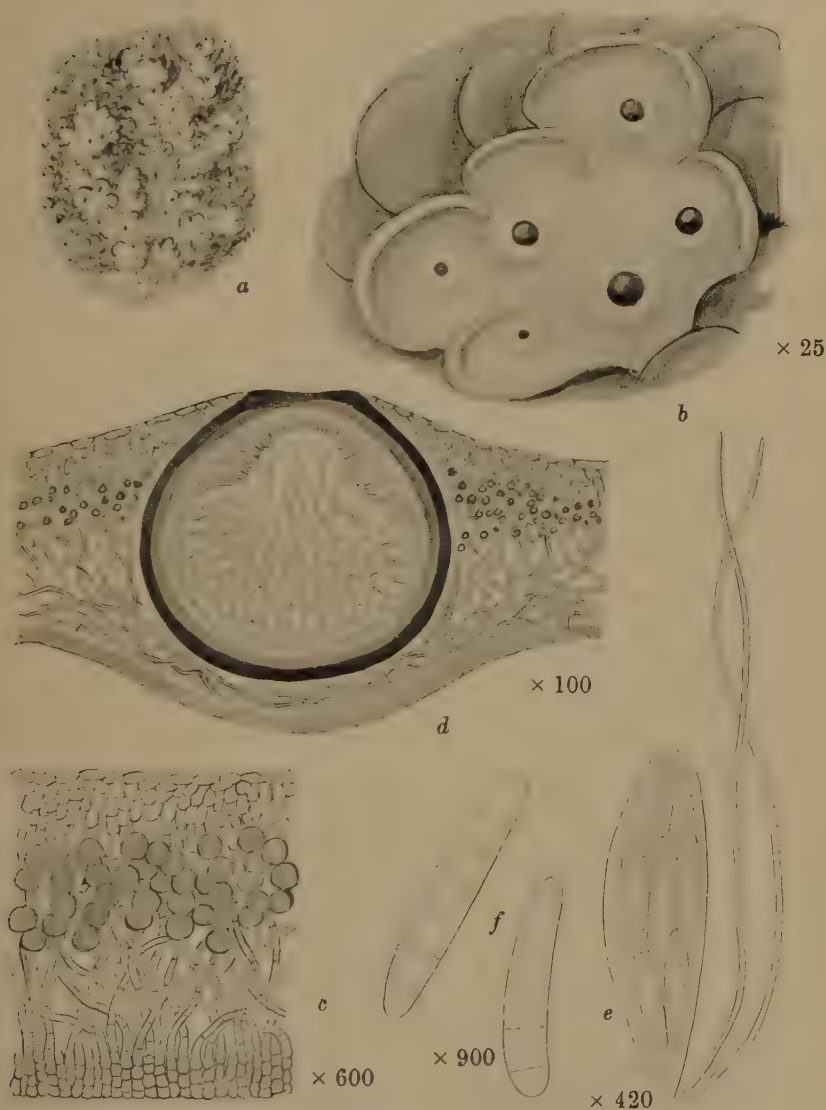
OBRYZUM DOLICHOTERON Nyl.

- a. Host plant (*Collema*) with parasite. b. Lobe of *Collema* with perithecia of parasite. c. Vertical section of perithecium and of host thallus. d. Ascus. e. Spores.



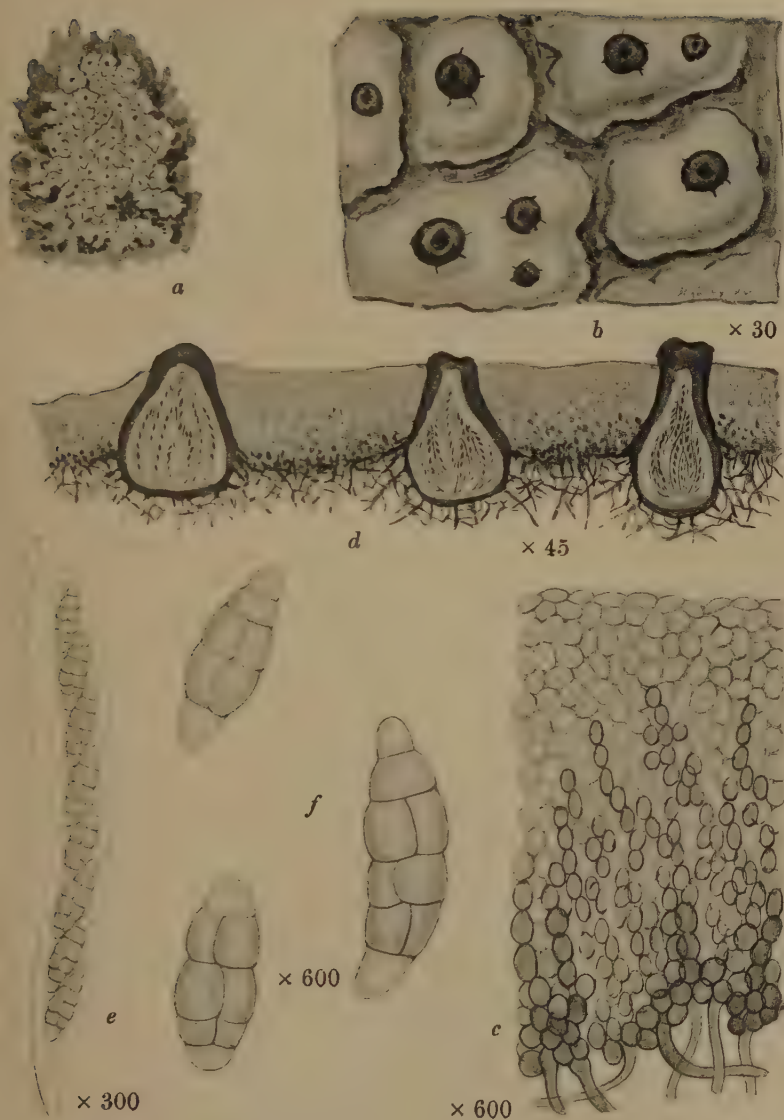
DERMATOCARPION LACHNEUM A. L. Sm.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecia. *e.* Ascus and paraphysis. *f.* Spores.



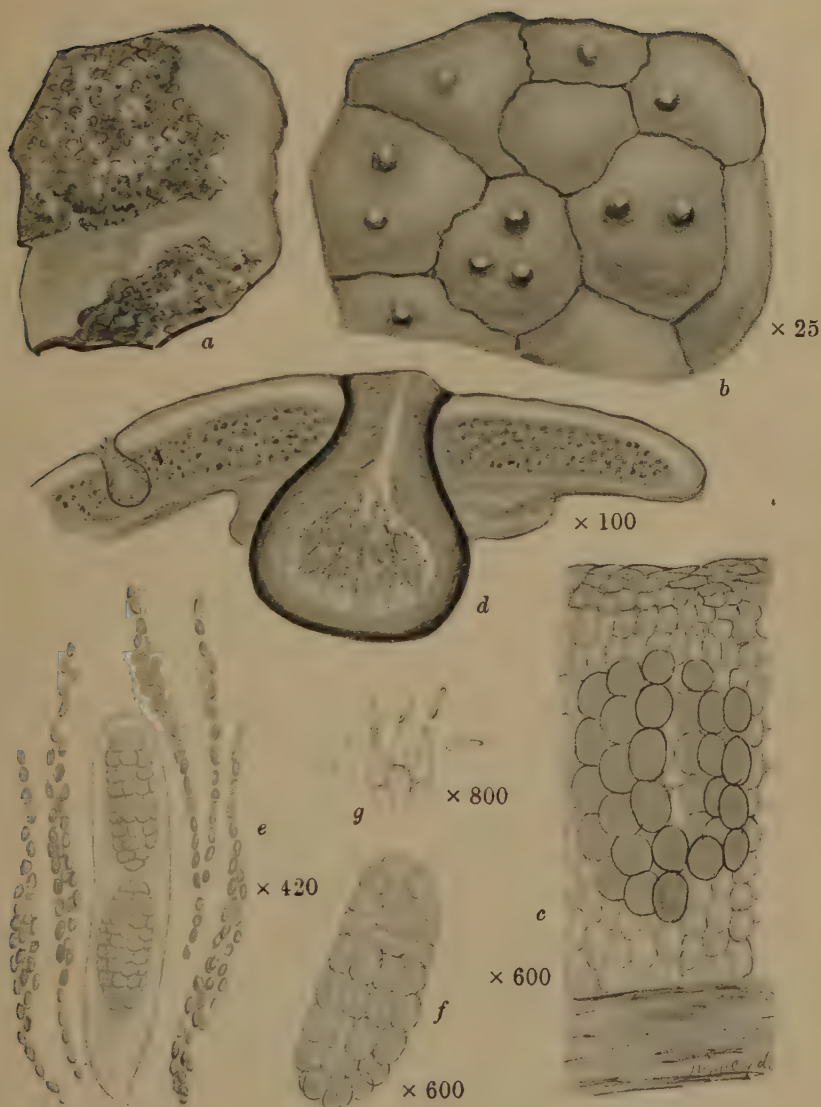
NORMANDINA PULCHELLA Cromb.

- a. Whole plant. b. Portion of thallus and perithecia. c. Vertical section of thallus. d. Vertical section of perithecium. e. Ascus and paraphyses. f. Spores.



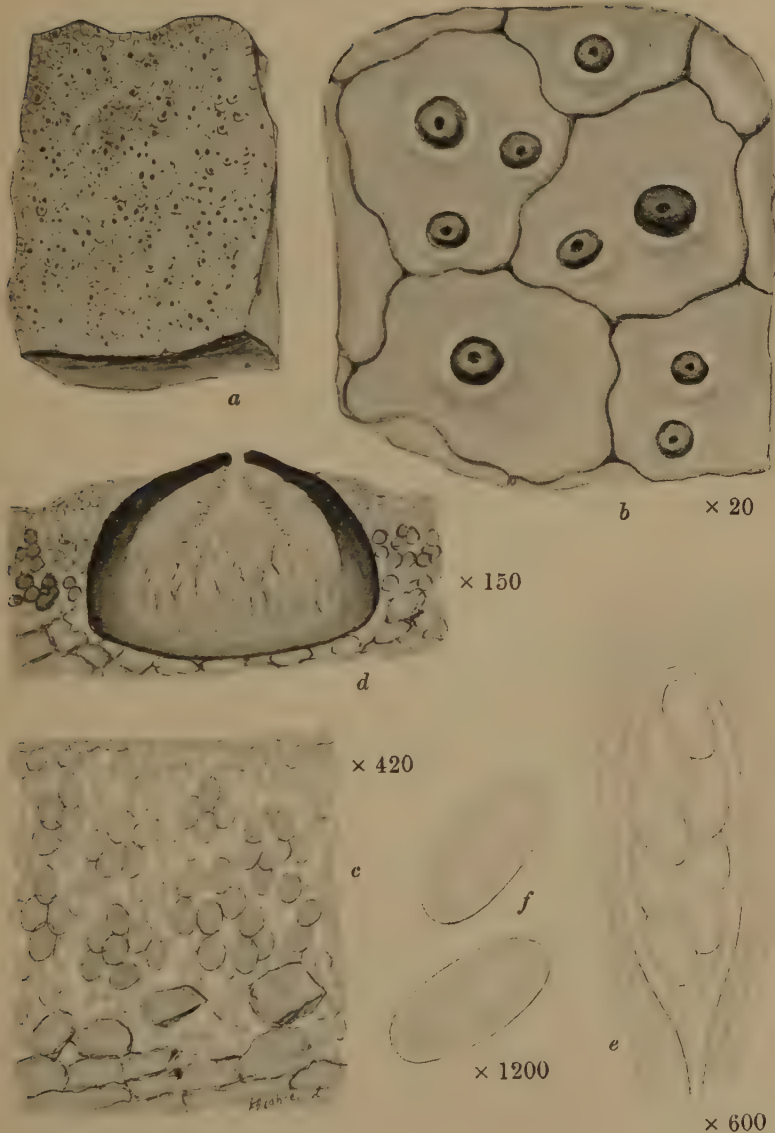
DACAMPIA HOOKERI Massal.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecia. *e.* Ascus and paraphysis. *f.* Spores.



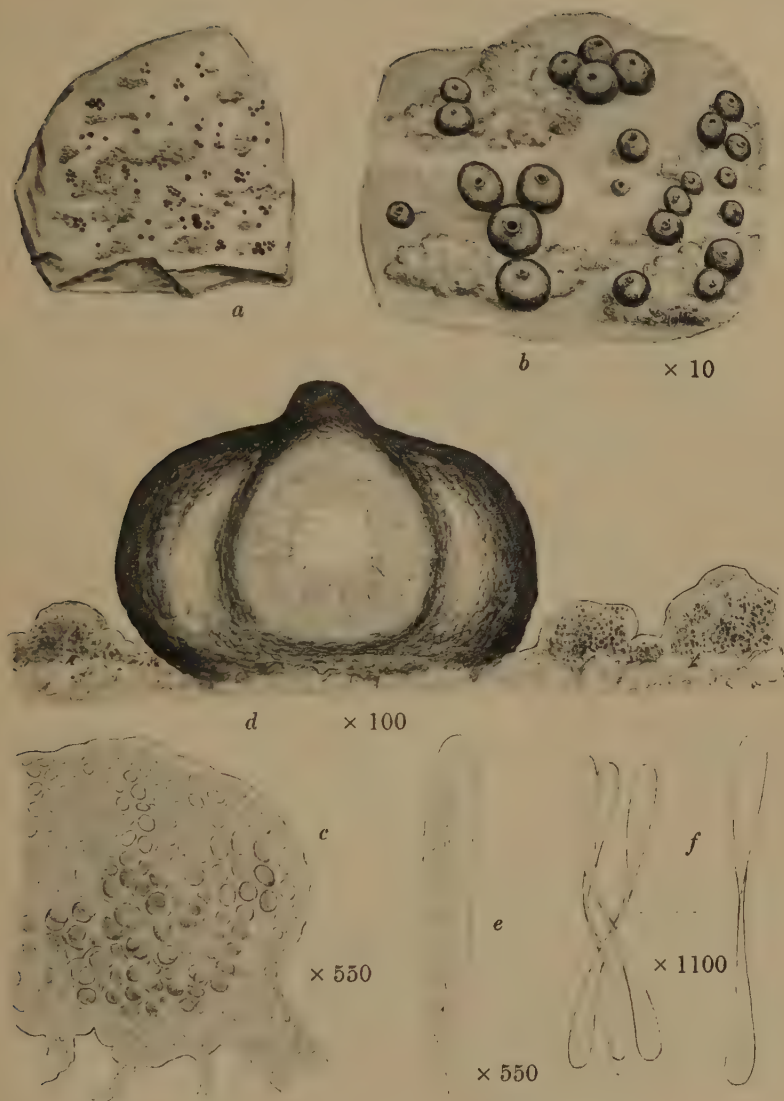
ENDOCARPON PUSILLUM Hedw.

- a.* Whole plant on soil. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecium and spermatogonium. *e.* Ascus and hymenial gonidia. *f.* Spore. *g.* Sterigmata and spermatia.



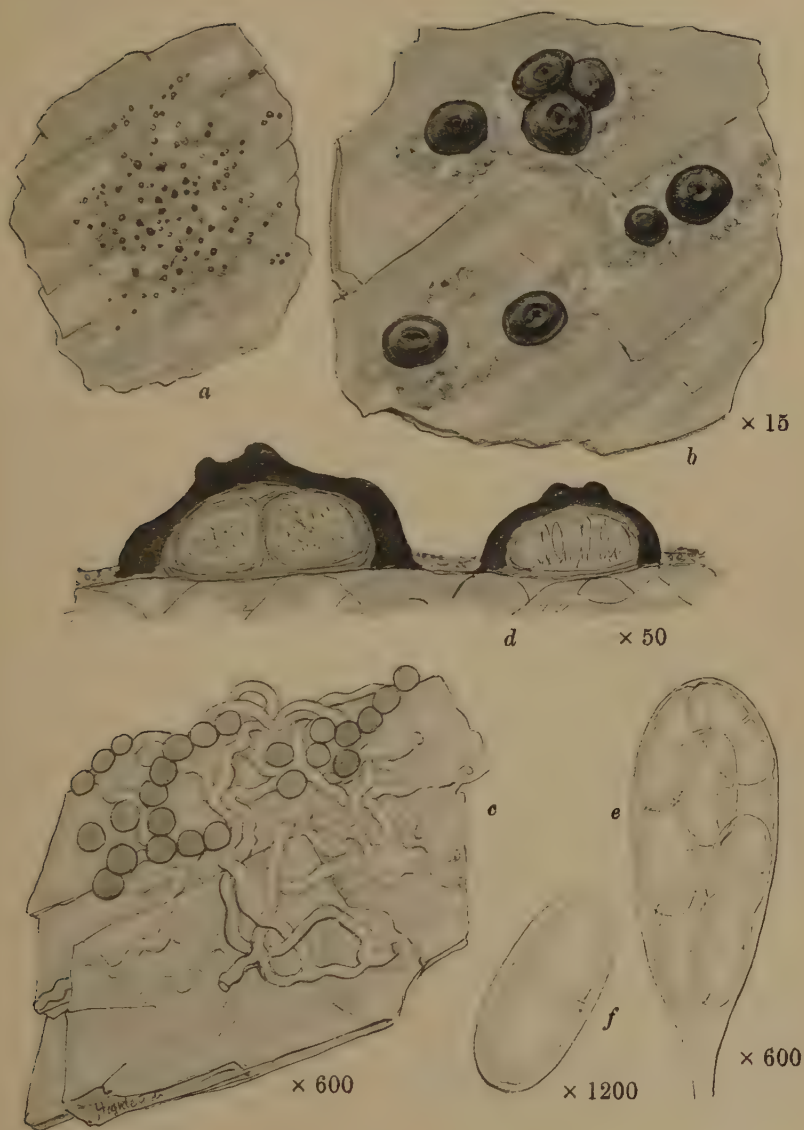
VERRUCARIA PAPILLOSA Ach.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecium. *e.* Ascus and paraphyses. *f.* Spores.



SARCOPYRENIA GIBBA Nyl.

- a.* Plant on rock. *b.* Portion of plant. *c.* Vertical section of thallus.
d. Vertical section of perithecium. *e.* Ascus. *f.* Spores.



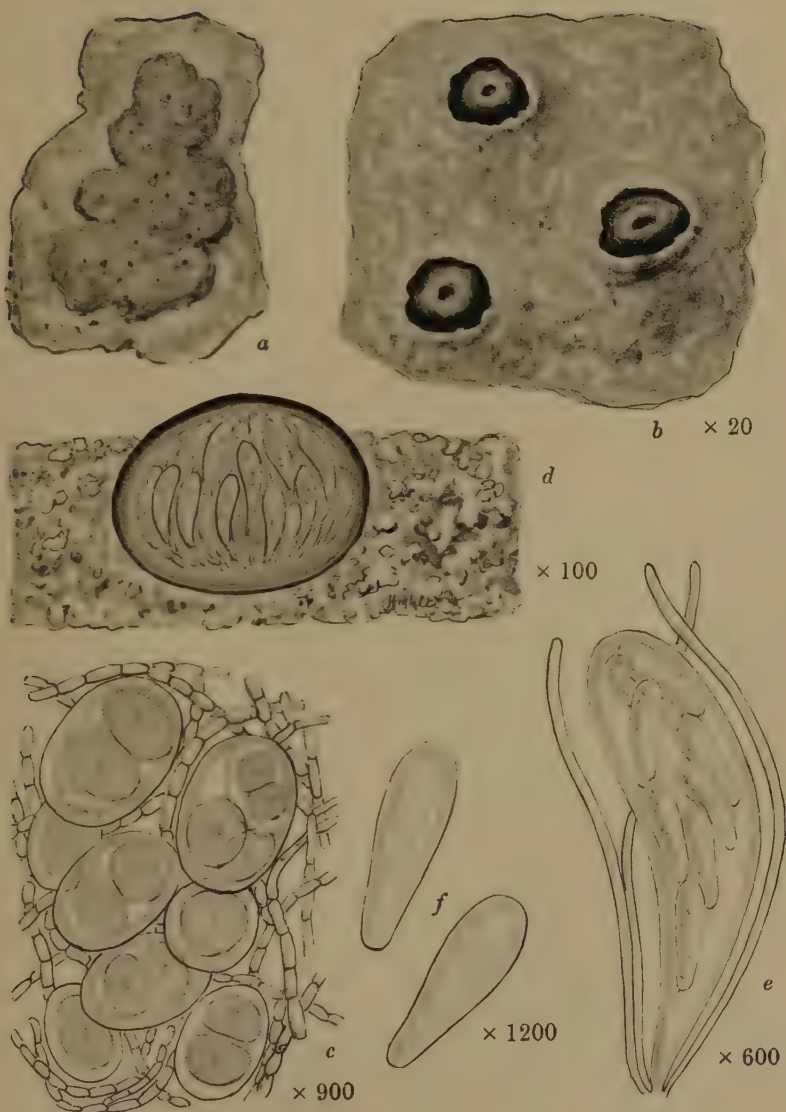
THELIDIUM PYRENOPHORUM Koerb.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Thalline hyphae and gonidia. *d.* Vertical section of perithecia. *e.* Ascus. *f.* Spore.



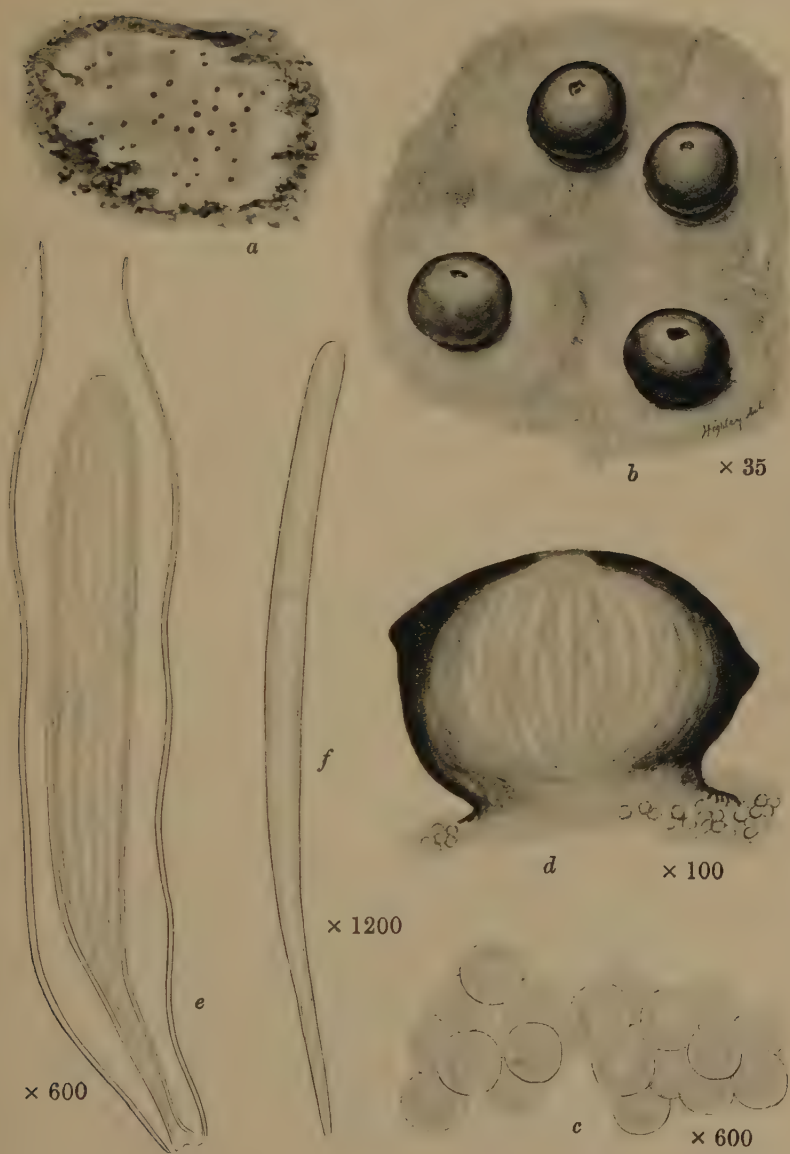
POLYBLASTIA THELEODES Th. Fr.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecium. *e.* Ascus and paraphysis. *f.* Spore.



THROMBIUM EPIGÆUM Wallr.

- a. Whole plant. b. Portion of thallus and perithecia. c. Vertical section of thallus. d. Vertical section of perithecium. e. Ascus and paraphyses. f. Spores.



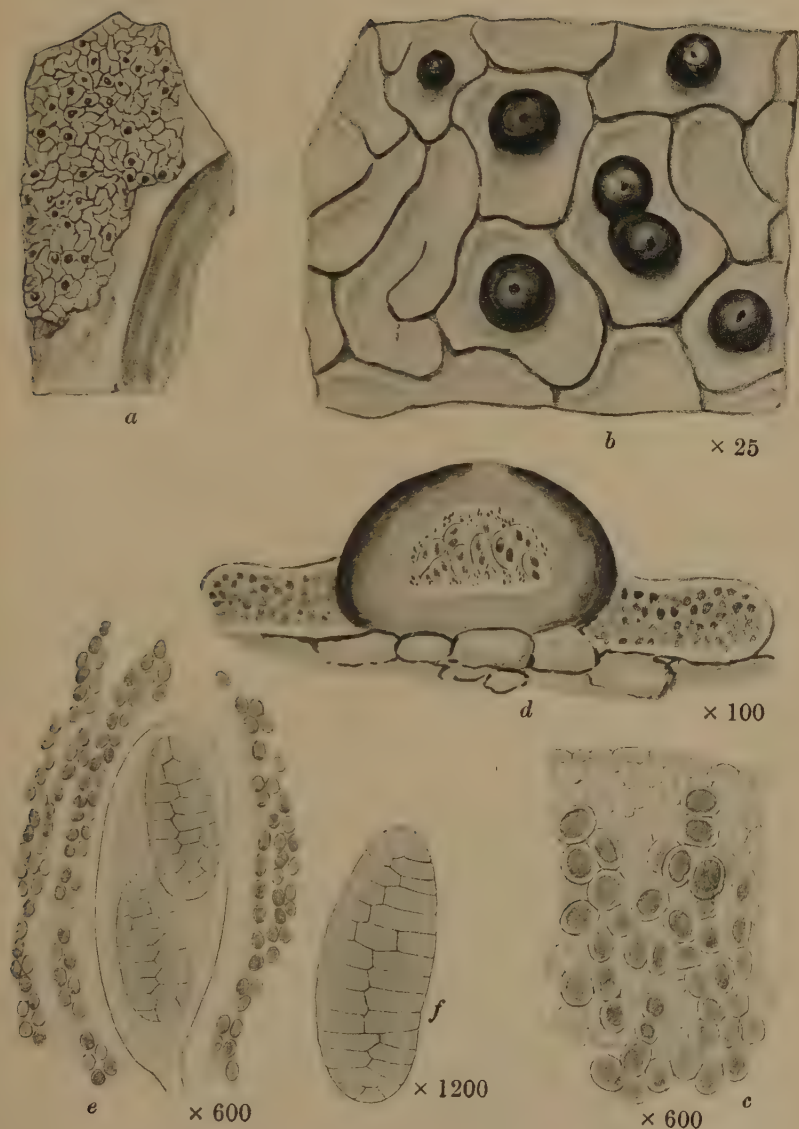
GONGYLIA VIRIDIS A. L. Sm.

- a. Whole plant. b. Portion of thallus and perithecia. c. Thalline gonidia.
d. Vertical section of perithecium. e. Ascus and paraphyses. f. Spore.



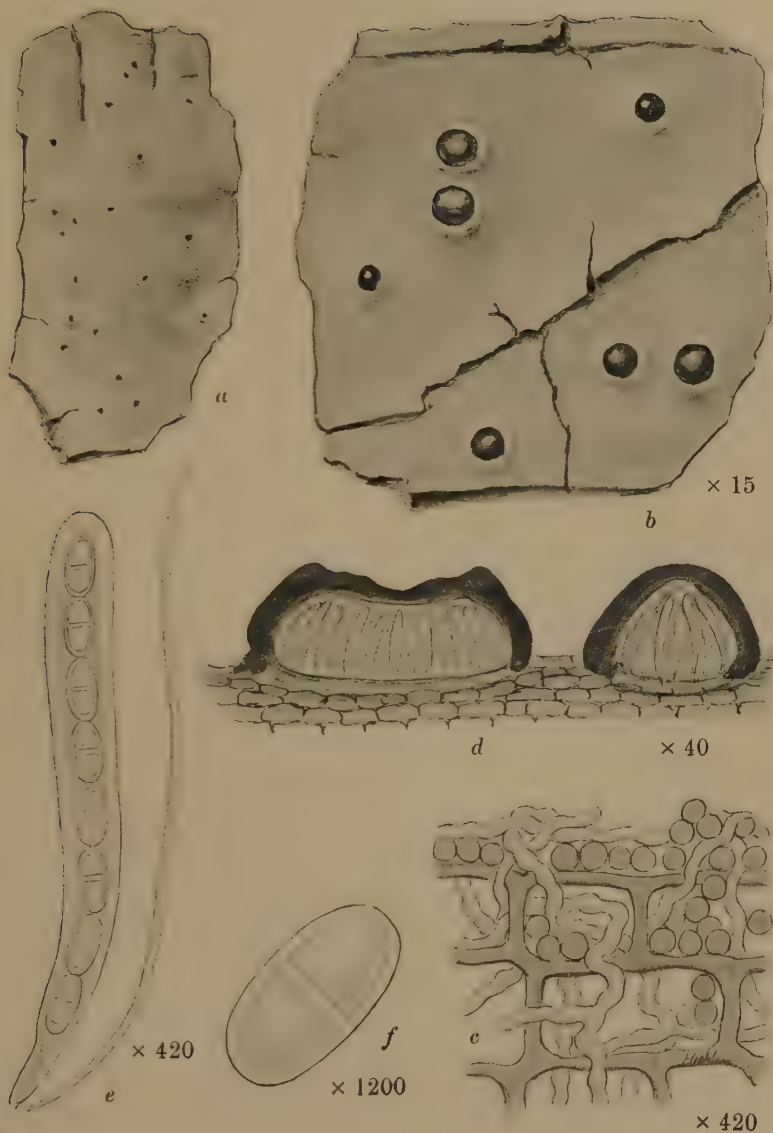
MICROGLAENA MODESTA A. L. Sm.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecium. *e.* Ascus and branching paraphysis. *f.* Spore.



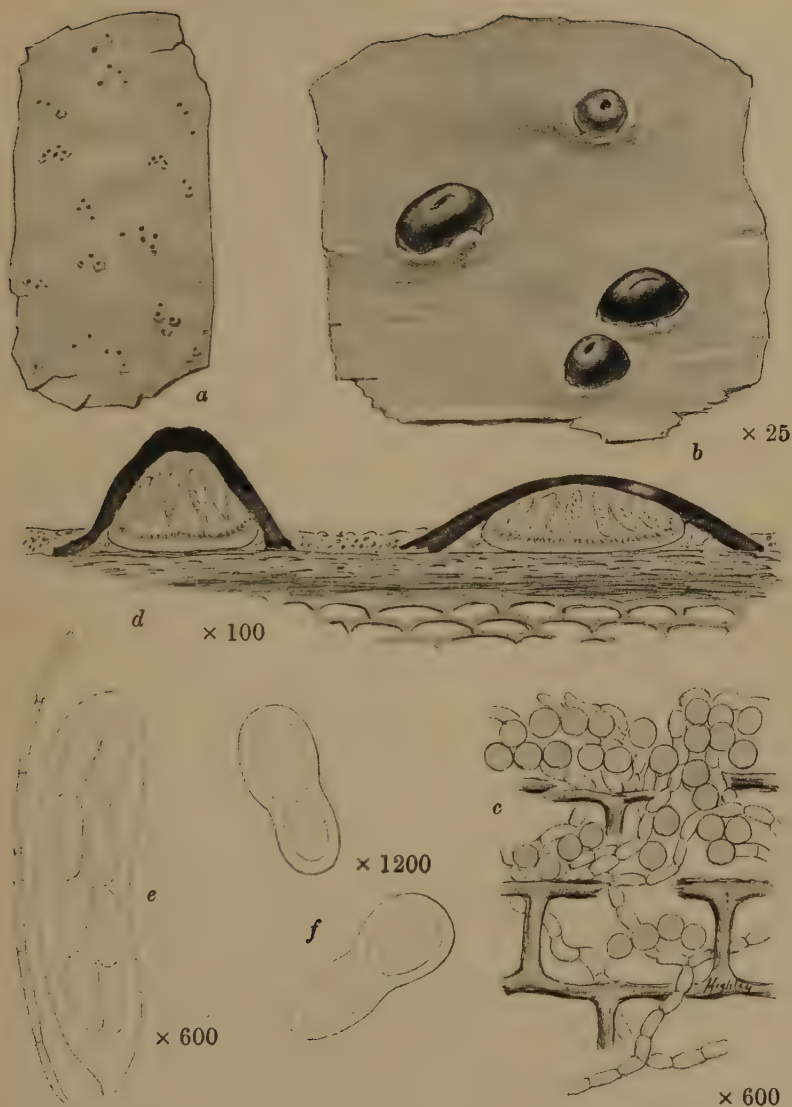
STAUROTHELE UMBRINUM A. L. Sm.

a. Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecium. *e.* Ascus and hymenial gonidia. *f.* Spore.



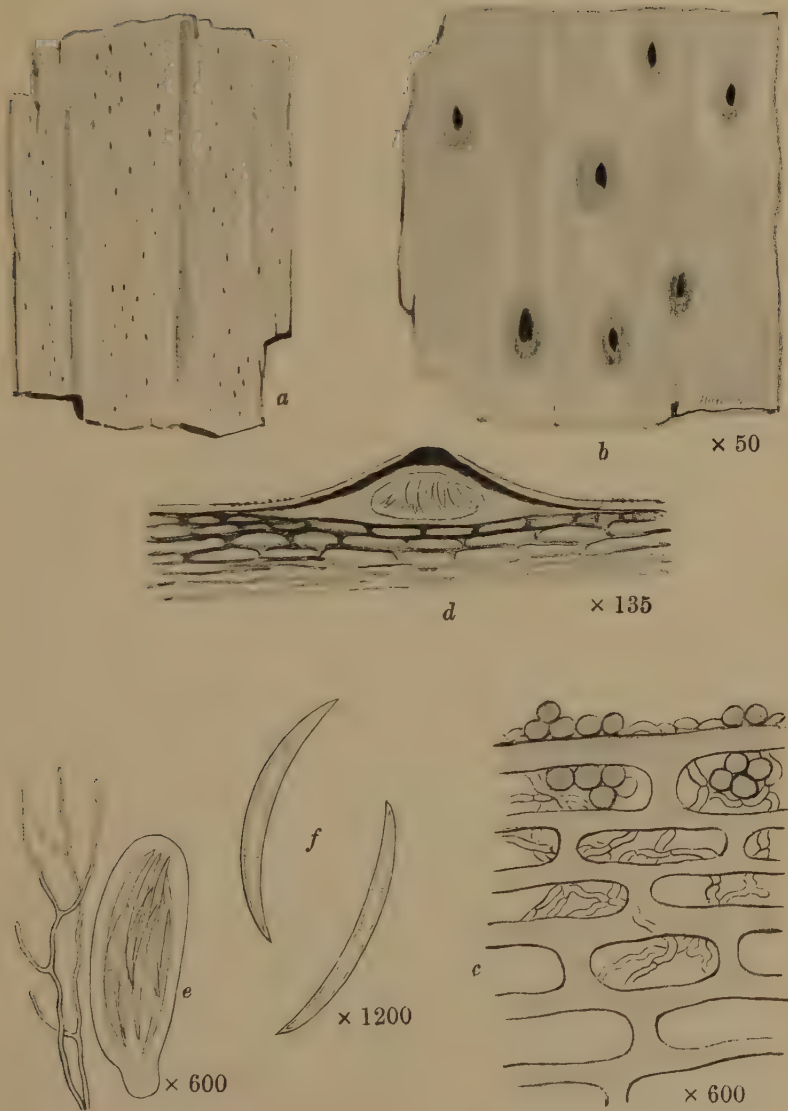
ACROCORDIA GEMMATA Koerb.

- a. Whole plant. b. Portion of thallus and perithecia. c. Vertical section of thallus. d. Vertical section of perithecia. e. Ascus and paraphysis. f. Spore.



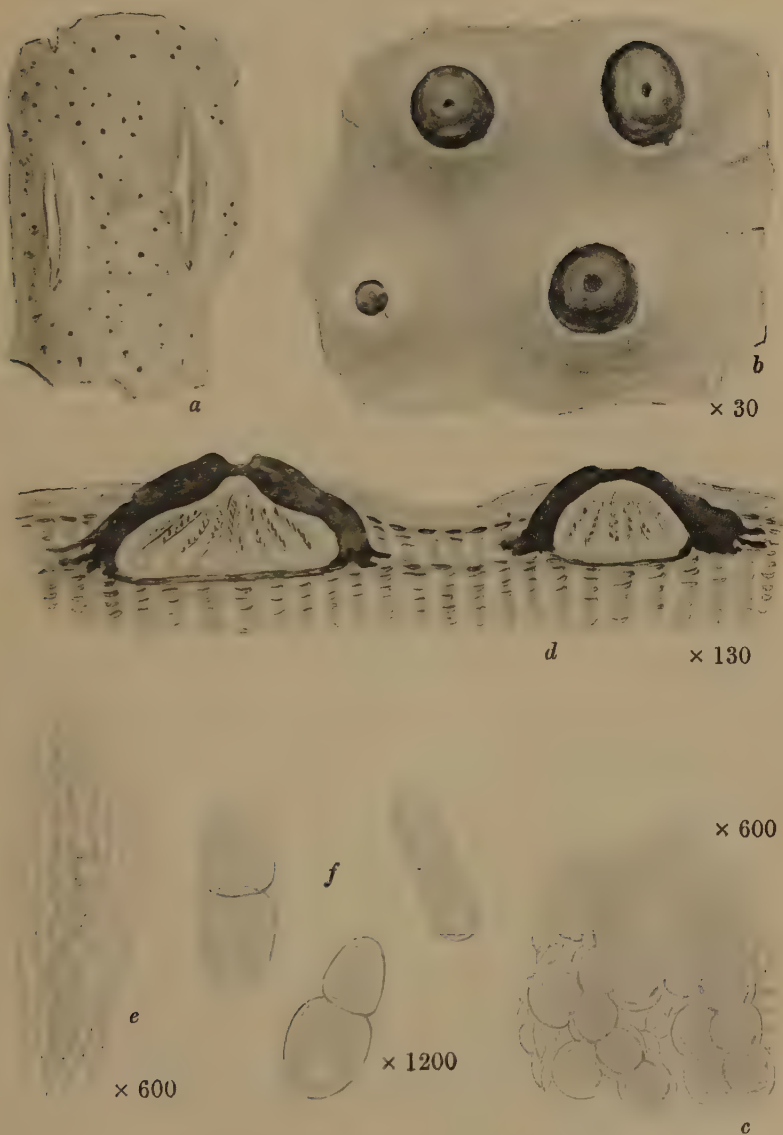
ARTHOPYRENIA FALLAX Arn.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecia. *e.* Ascus and paraphysis. *f.* Spores.



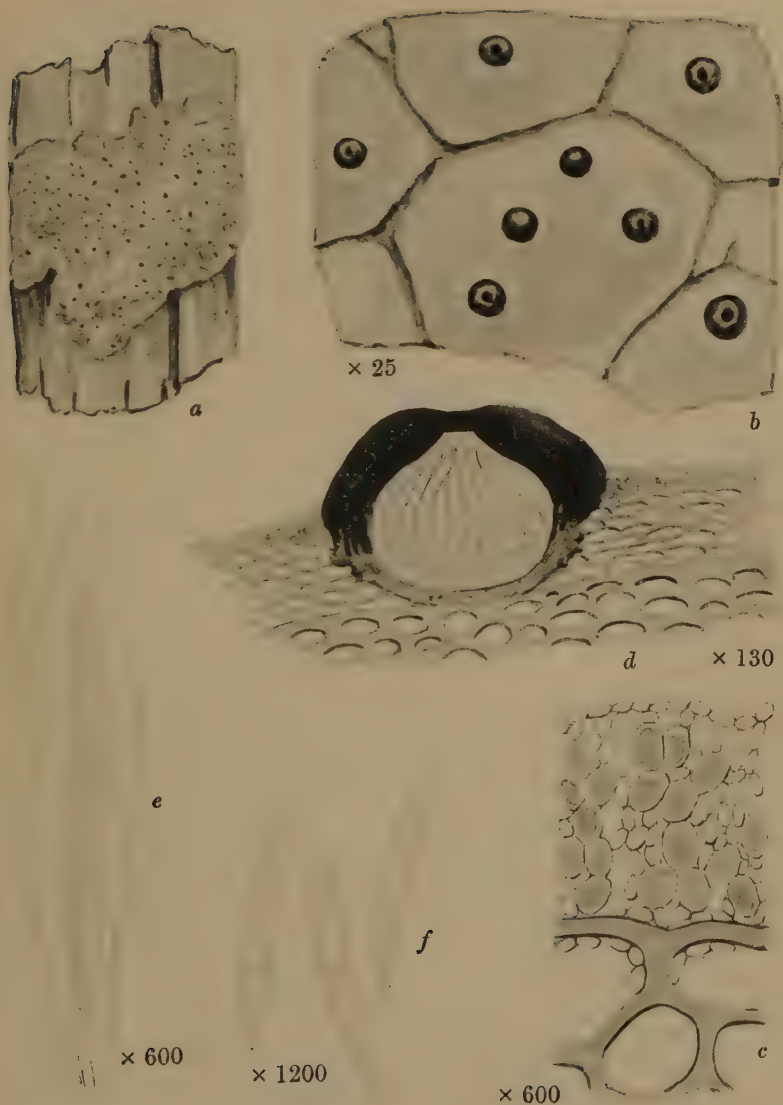
LEPTORHAPHIS EPIDERMIDIS Th. Fr.

- a. Whole plant. b. Portion of thallus and perithecia. c. Vertical section of thallus. d. Vertical section of perithecium. e. Ascus and paraphyses. f. Spores.



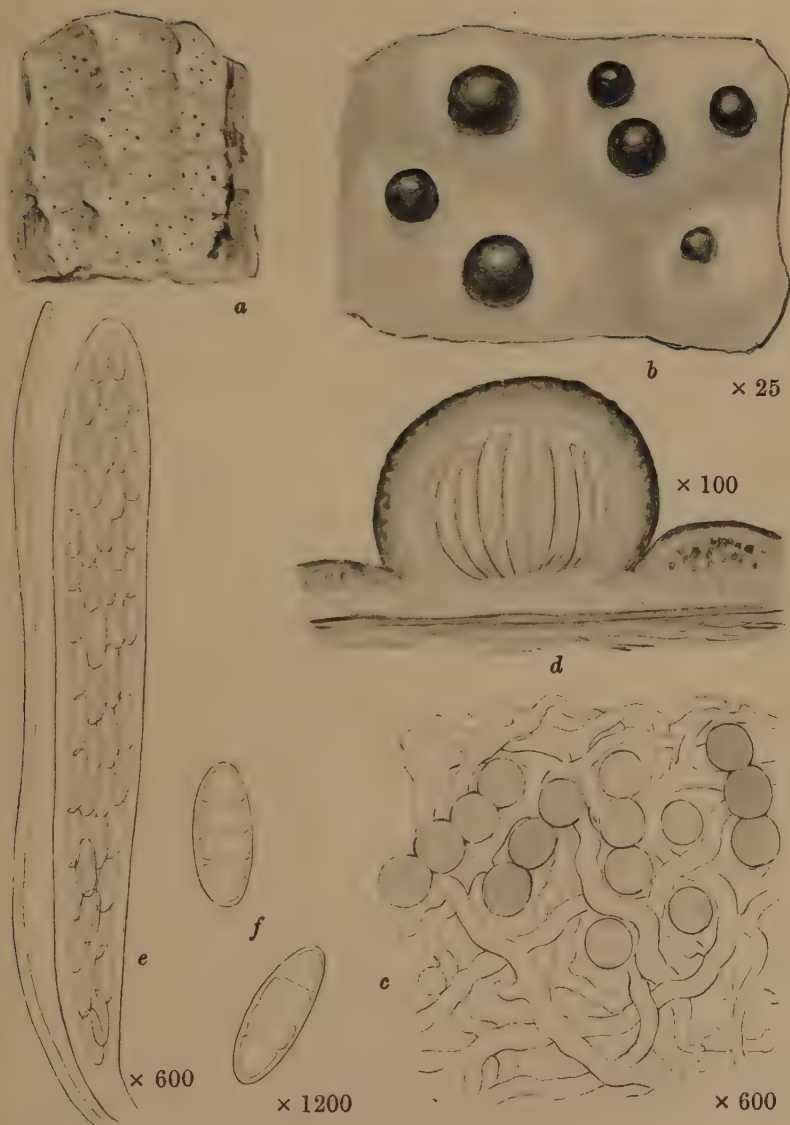
MICROTHELIA MICULA Flot.

- a. Whole plant. b. Portion of thallus and perithecia. c. Vertical section of thallus. d. Vertical section of perithecia. e. Ascus and paraphyses. f. Spores.



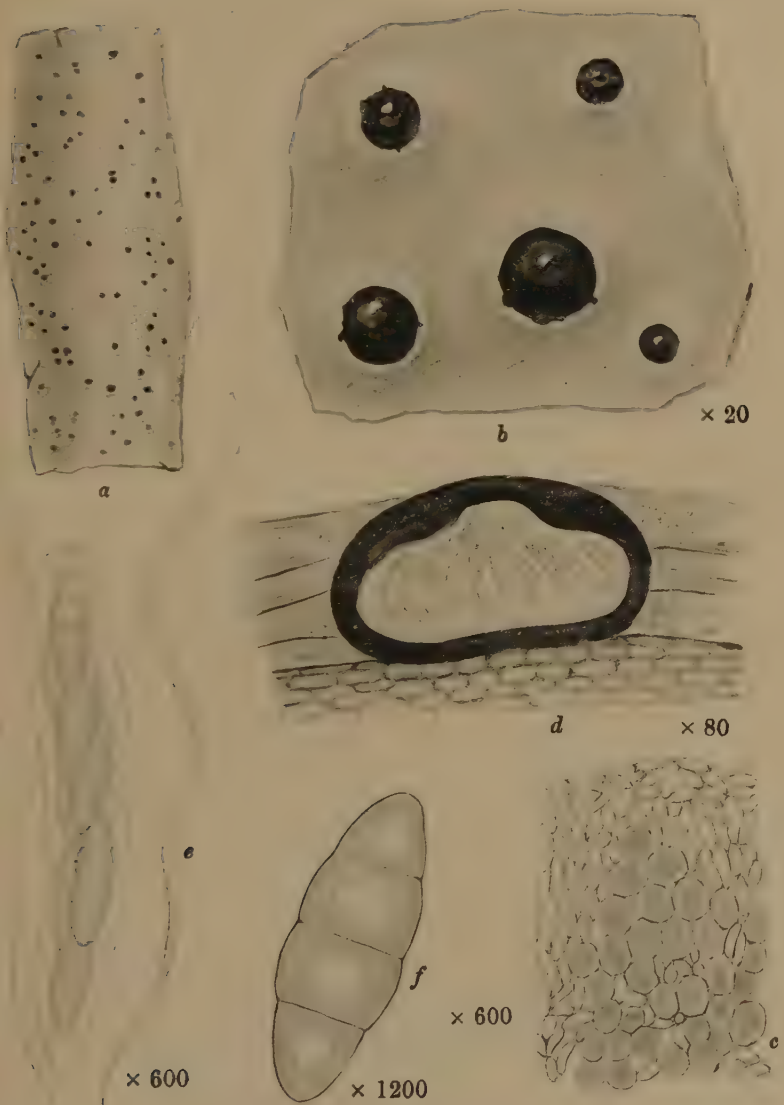
PORINA OLIVACEA A. L. Sm.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecium. *e.* Ascus and paraphyses. *f.* Spores.



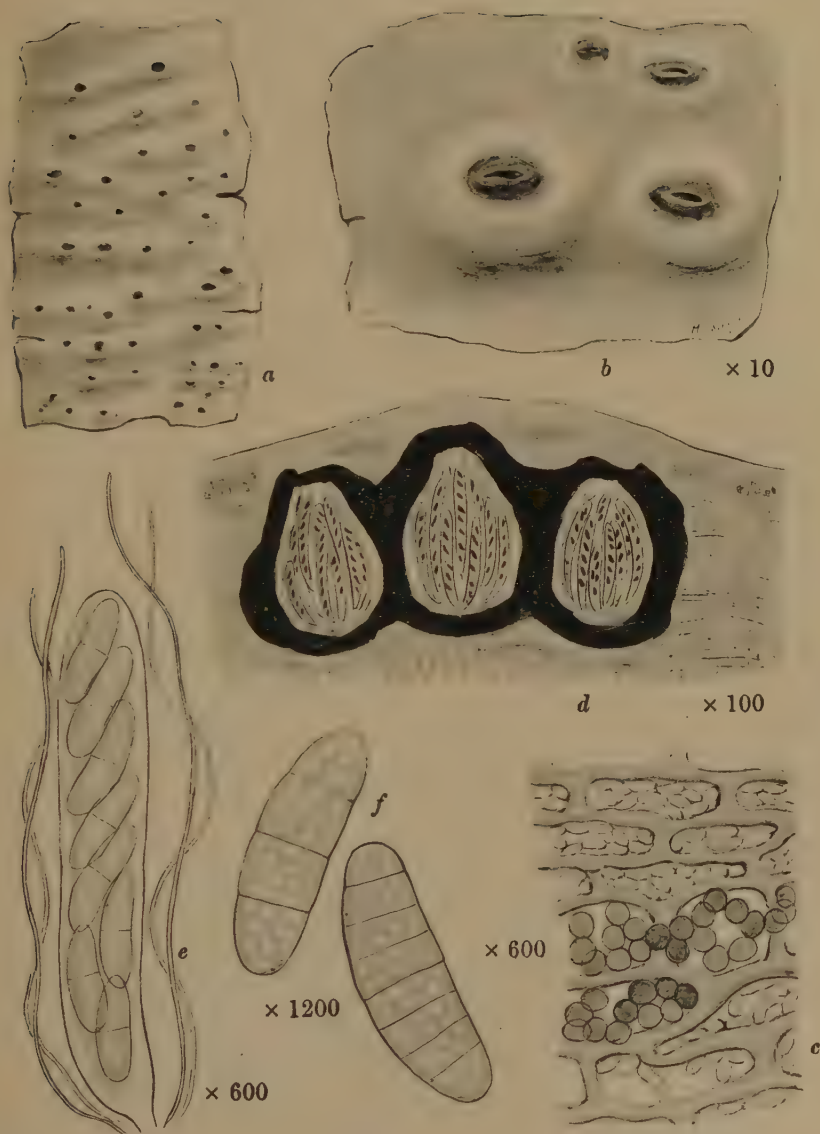
THELOPSIS RUBELLA Nyl.

- a.** Whole plant. **b.** Portion of thallus and perithecia. **c.** Vertical section of thallus. **d.** Vertical section of perithecium. **e.** Ascus and paraphysis. **f.** Spores.



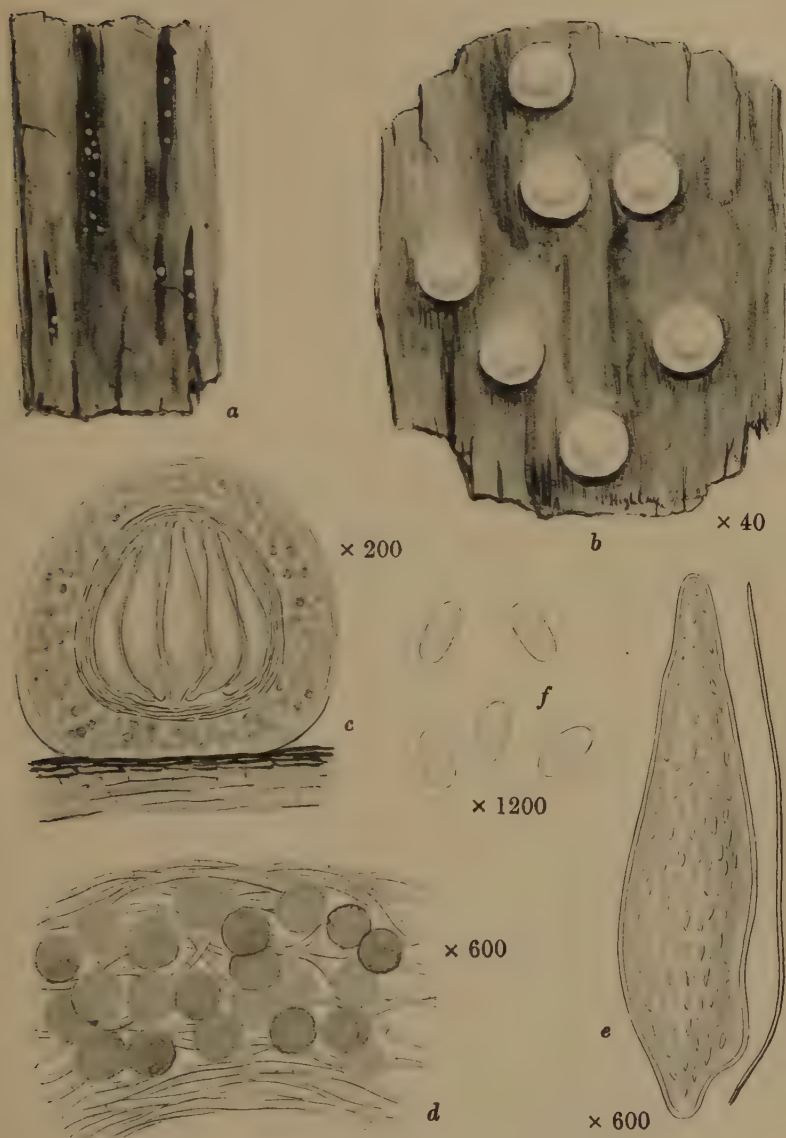
PYRENULA NITIDA Ach.

- a. Whole plant. b. Portion of thallus and perithecia. c. Vertical section of thallus. d. Vertical section of perithecium. e. Ascus and paraphyses. f. Spore.



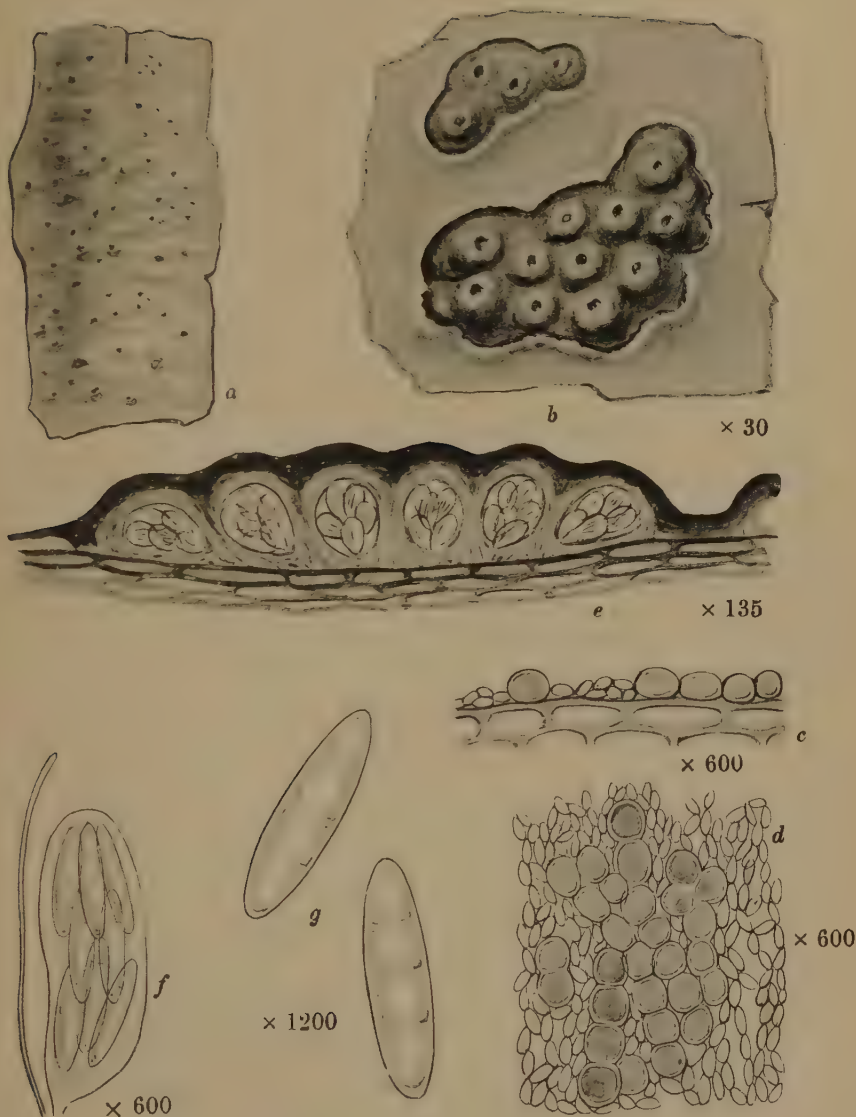
ANTHRACOTHECIUM HIBERNICUM A. L. Sm.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecia. *e.* Ascus and paraphyses. *f.* Spores.



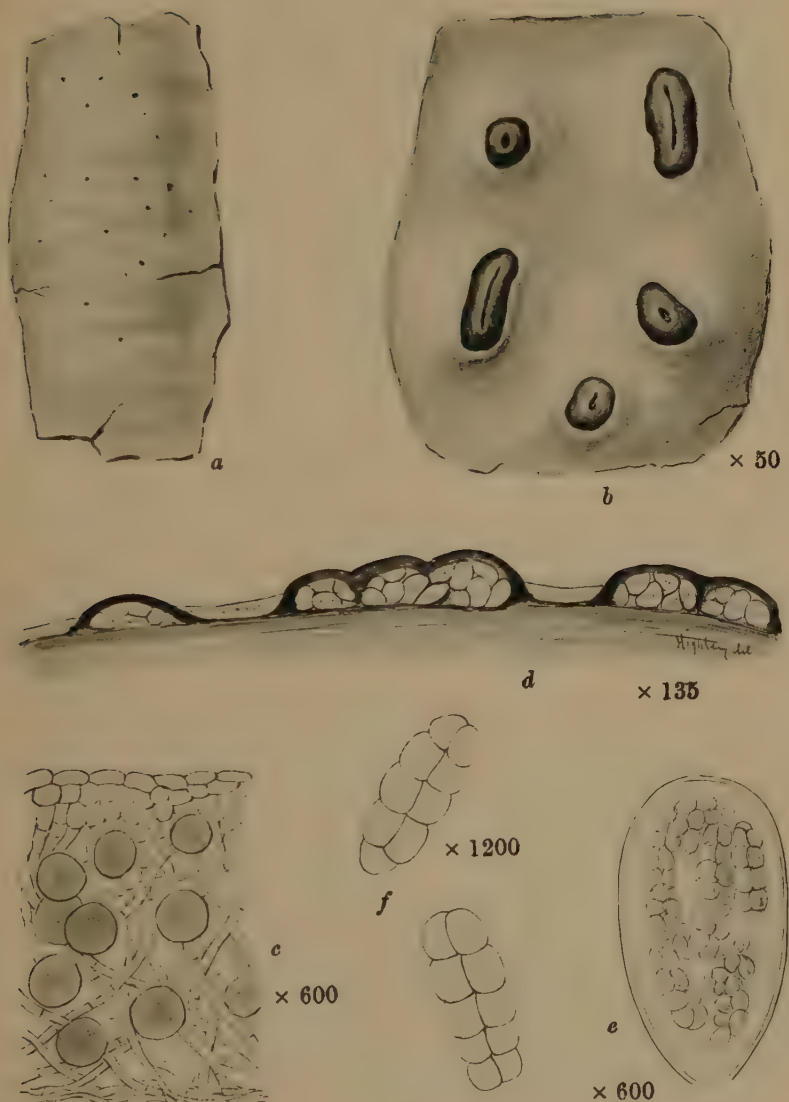
THELOCARPON LAURERI Nyl.

a. Whole plant. *b.* Perithecia. *c.* Vertical section of perithecium.
d. Section of perithecial wall. *e.* Ascus and paraphysis. *f.* Spores.



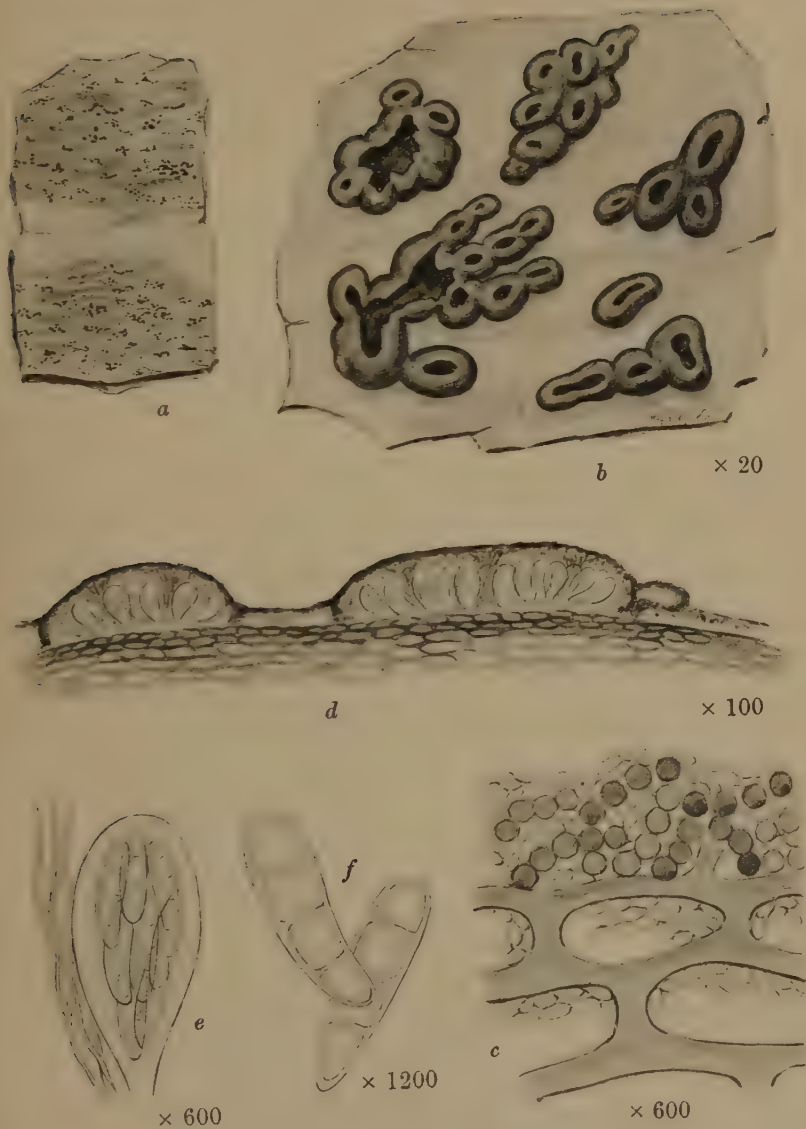
MELANOTHECA GELATINOSA Nyl.

- a. Whole plant. b. Portion of thallus and perithecia. c. Vertical section of thallus. d. Thallus in surface view. e. Vertical section of perithecia. f. Ascus and paraphysis. g. Spores.



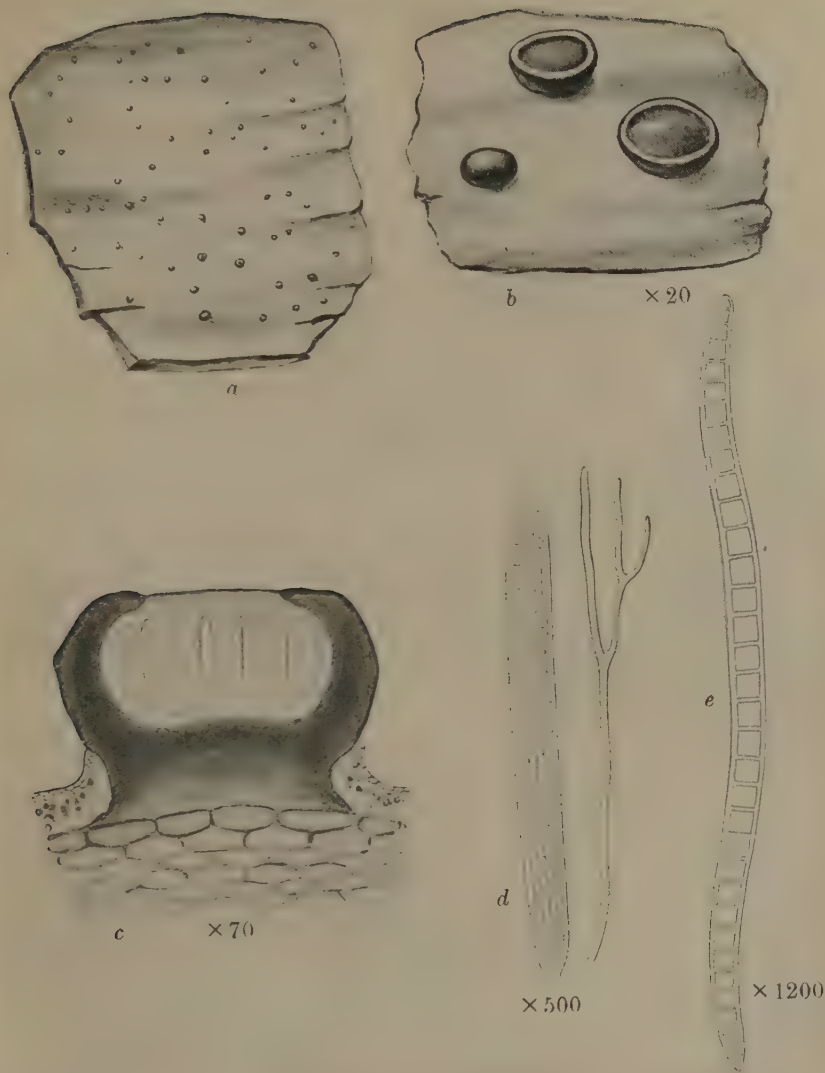
MYCOPORUM MISERRIMUM Nyl.

a. Whole plant. b. Portion of thallus and perithecia. c. Vertical section of thallus. d. Vertical section of perithecia. e. Ascus. f. Spores.



MYCOPORELLUM OBSCURUM A. L. Sm.

- a.* Whole plant. *b.* Portion of thallus and perithecia. *c.* Vertical section of thallus. *d.* Vertical section of perithecia. *e.* Ascus and paraphyses. *f.* Spores.



CONOTREMA URCEOLATUM Tuckerm.

a. Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of apothecium. *d.* Ascus and paraphysis. *e.* Single spore.

